Multiple Choice Questions (100 % Challenge)

1. **If $f(x) = x^2 - 2x + 1$, then $f(0) =$**
   (a) -1 (b) 0 (c) ✔ 1 (d) 2
2. **When we say that f is function from set X to set Y, then X is called**
   (a) ✔Domain of f (b) Range of f (c) Codomain of f (d) None of these
3. **The term "Function" was recognized by______ to describe the dependence of one quantity to another.**
   (a) ✔Lebnitz (b) Euler (c) Newton (d) Lagrange
4. **If $f(x) = x^2$ then the range of f is**
   (a) ✔ [0,∞) (b) (-∞, 0] (c) $(0, \infty)$ (d) None of these
5. $Cosh^2x - Sinh^2x =$
   (a) -1 (b) 0 (c) ✔1 (d) None of these
6. $cosechx$ **is equal to**
   (a) $\frac{2}{e^x+e^{-x}}$ (b) $\frac{1}{e^x-e^{-x}}$ (c) ✔ $\frac{2}{e^x-e^{-x}}$ (d) $\frac{2}{e^{-x}+e^x}$
7. **The domain and range of identity function , $I: X \to X$ is**
   (a) ✔X (b) +iv real numbers (c) –iv real numbers (d) integers
8. **The linear function $f(x) = ax + b$ is constant function if**
   $a \neq 0, b = 1$ (b) $a = 1, b = 0$ (c) $a = 1, b = 1$ (d) ✔ $a = 0$
9. **If $f(x) = 2x + 3$, $g(x) = x^2 - 1$, then $(gof)(x) =$**
   (a) $2x^2 - 1$ (b) ✔ $4x^2 + 4x$ (c) $4x + 3$ (d) $x^4 - 2x^2$
10. **If $f(x) = 2x + 3$, $g(x) = x^2 - 1$, then $(gog)(x) =$**
    (b) $2x^2 - 1$ (b) $4x^2 + 4x$ (c) $4x + 3$ (d) ✔ $x^4 - 2x^2$
11. **The inverse of a function exists only if it is**
    (a) an into function (b) an onto function (c) ✔ (1-1) and into function (d) None of these
12. **If $f(x) = 2 + \sqrt{x-1}$, then domain of $f^{-1} =$**
    (a)]2,∞[(b) ✔ [2,∞[(c) [1,∞[(d)]1,∞[
13. $\lim_{x\to\infty} e^x =$
    (a) 1 (b) ∞ (c) ✔ 0 (d) -1
14. $\lim_{x\to 0} \frac{\sin(x-3)}{x-3} =$
    (a) ✔1 (b) ∞ (c) $\frac{sin3}{3}$ (d) -3
15. $\lim_{x\to 0} \frac{\sin(x-a)}{x-a} =$
    (a) ✔1 (b) ∞ (c) $\frac{sina}{a}$ (d) -3
16. $f(x) = x^3 + x$ **is :**
    (a) Even (b) ✔ Odd (c) Neither even nor odd (d) None
17. **If $f: X \to Y$ is a function , then elements of x are called**
    (a) Images (b) ✔ Pre-Images (c) Constants (d) Ranges
18. $\lim_{x\to 0} \left(\frac{x}{1+x}\right) =$
    (a) e (b) ✔ e^{-1} (c) e^2 (d) $\sqrt{e}$
19. $\lim_{x\to 0} \frac{a^x-1}{x}$ **is equal to**
    (a) log_{e^x} (b)log_{a^x} (c) a (d) ✔ log_{e^a}
20. $\lim_{x\to 0} \frac{Sinx^\circ}{x} =$

(a) ✔ $\frac{\pi}{180°}$ (b) $\frac{180°}{\pi}$ (c) $180\,\pi$ (d) 1

21. **A function is said to be continuous at $x = c$ if**
(a) $\lim_{x\to c} f(x)$ exists (b) $f(c)$ is defined (c) $\lim_{x\to c} f(x) = f(c)$ (d) ✔ All of these
22. **The function $f(x) = \frac{x^2-1}{x-1}$ is discontinuous at**
(a) ✔1 (b) 2 (c) 3 (d) 4
1. **L.H.L of $f(x) = |x-5|$ at $x = 5$ is**
23. 5 (b) ✓0 (c) 2 (d) 4

24. **The change in variable x is called increment of x. It is denoted by δx which is**
(a) +iv only (b) –iv only (c) ✔ +iv or –iv (d) none of these
25. **The notation $\frac{dy}{dx}$ or $\frac{df}{dx}$ is used by**
(a) ✔Leibnitz (b) Newton (c) Lagrange (d) Cauchy
26. **The notation $\dot{f}(x)$ is used by**
(a) Leibnitz (b) ✔ Newton (c) Lagrange (d) Cauchy
27. **The notation $f'(x)$ or y' is used by**
(a) Leibnitz (b) Newton (c) ✔ Lagrange (d) Cauchy
28. **The notation $Df(x)$ or Dy is used by**
(a) Leibnitz (b) Newton (c) Lagrange (d) ✔ Cauchy
29. $\lim_{x\to a}\frac{f(x)-f(a)}{x-a} =$
(a) ✔$f'(x)$ (b) $f'(a)$ (c) $f(0$ (d) $f(x-a)$
30. $\frac{d}{dx}(x^n) = nx^{n-1}$ **is called**
(a) ✔ Power rule (b) Product rule (c) Quotient rule (d) Constant

31. **The derivative of a constant function is**
(a) one (b) ✔ zero (c) undefined (d) None of these
32. **The process of finding derivatives is called**
(a) ✔Differentiation (b) differential (c) Increment (d) Integration
33. **If** $f(x) = \frac{1}{x}$, $then$ $f''(a) =$
(a) $-\frac{2}{(a)^3}$ (b) $-\frac{1}{a^2}$ (c) $\frac{1}{a^2}$ (d) ✔ $\frac{2}{a^3}$
34. $(fog)'(x) =$
(a) $f'g'$ (b) $f'g(x)$ (c) ✔ $f'(g(x))g'(x)$ (d) cannot be calculated
35. $\frac{d}{dx}\left(g(x)\right)^n =$
(a) $n[g(x)]^{n-1}$ (b) $n[(g(x)]^{n-1}g(x)$ (c) ✔ $n[(g(x)]^{n-1}g'(x)$ (d) $[g(x)]^{n-1}g'(x)$
36. $\frac{d}{dx}\left(3x^{\frac{4}{3}}\right) =$
(a) $4x^{\frac{2}{3}}$ (b) ✔$4x^{\frac{1}{3}}$ (c) $2x^{\frac{1}{3}}$ (d) $3x^{\frac{1}{3}}$
37. **If $x = at^2$ and $y = 2at$ then** $\frac{dy}{dx} =$
(a) $\frac{2}{ya}$ (b) $\frac{y}{2a}$ (c) ✔ $\frac{2a}{y}$ (d) $\frac{2}{y}$
38. $\frac{d}{dx}\left(tan^{-1}x - cot^{-1}x\right) =$
(a) $\frac{2}{\sqrt{1+x^2}}$ (b) ✔ $\frac{2}{1+x^2}$ (c) 0 (d) $\frac{-2}{1+x^2}$
39. **If $Sin\,\sqrt{x}$, then $\frac{dy}{dx}$ is equal to**

(a) ✔ $\frac{\cos\sqrt{x}}{2\sqrt{x}}$ (b) $\frac{\cos\sqrt{x}}{\sqrt{x}}$ (c) $\cos\sqrt{x}$ (d) $\frac{\cos x}{\sqrt{x}}$

40. $\frac{d}{dx}\sec^{-1}x =$

(a) ✔ $\frac{1}{|x|\sqrt{x^2-1}}$ (b) $\frac{-1}{|x|\sqrt{x^2-1}}$ (c) $\frac{1}{|x|\sqrt{1+x^2}}$ (d) $\frac{-1}{|x|\sqrt{1+x^2}}$

41. $\frac{d}{dx}\mathrm{cosec}^{-1}x =$

(a) $\frac{1}{|x|\sqrt{x^2-1}}$ (b) ✔ $\frac{-1}{|x|\sqrt{x^2-1}}$ (c) $\frac{1}{|x|\sqrt{1+x^2}}$ (d) $\frac{-1}{|x|\sqrt{1+x^2}}$

42. Differentiating $\sin^3 x$ w.r.t $\cos^2 x$ is

(a) ✔ $-\frac{3}{2}\sin x$ (b) $\frac{3}{2}\sin x$ (c) $\frac{2}{3}\cos x$ (d) $-\frac{2}{3}\cos x$

43. If $\frac{y}{x} = Tan^{-1}\frac{x}{y}$ then $\frac{dy}{dx} =$

(a) $\frac{x}{y}$ (b) $-\frac{x}{y}$ (c) ✔ $\frac{y}{x}$ (d) $-\frac{y}{x}$

44. If $\tan y(1+\tan x) = 1-\tan x$, show that $\frac{dy}{dx} =$

(a) 0 (b) 1 (c) ✔ -1 (d) 2

45. $\frac{d}{dx}(Sin^{-1}x) = \frac{1}{\sqrt{1-x^2}}$ is valid for

(a) $0 < x < 1$ (b) $-1 < x < 0$ (c) ✔ $-1 < x < 1$ (d) None of these

46. If $y = x\sin^{-1}\left(\frac{x}{a}\right) + \sqrt{a^2-x^2}$ then $\frac{dy}{dx} =$

(a) $Cos^{-1}\frac{x}{a}$ (b) $Sec^{-1}\frac{x}{a}$ (c) ✔ $Sin^{-1}\frac{x}{a}$ (d) $Tan^{-1}\frac{x}{a}$

47. If $y = e^{-ax}$, then $y\frac{dy}{dx} =$

(a) ✔ $-ae^{-2ax}$ (b) $-a^2e^{ax}$ (c) a^2e^{-2ax} (d) $-a^2e^{-2ax}$

48. $\frac{d}{dx}(10^{\sin x}) =$

(a) $10^{\cos x}$ (b) ✔ $10^{\sin x}.\cos x.\ln 10$ (c) $10^{\sin x}.\ln 10$ (d) $10^{\cos x}.\ln 10$

49. If $y = e^{ax}$ then $\frac{dy}{dx} =$

(a) $\frac{1}{e^x}$ (b) ✔ ae^{ax} (c) e^{ax} (d) $\frac{1}{a}e^{ax}$

50. $\frac{d}{dx}(a^x) =$

(a) a^x (b) $e^x\ln a$ (c) ✔ $a^x.\ln a$ (d) $x^a.\ln a$

51. The function $f(x) = a^x, a > 0, a \neq 0$, and x is any real number is called

(a) ✔ Exponential function (b) logarithmic function (c) algebraic function (d) composite function

1. If $a > 0, a \neq 1$, and $x = a^y$ then the function defined by $y = \log a^x\ (x > 0)$ is called a logarithmic function with base

(a) 10 (b) e (c) ✔ a (d) x

52. $\log_{a^a} =$

(a) ✔ 1 (b) e (c) a^2 (d) not defined

53. $\frac{d}{dx}\log_{a^x} =$

(a) $\frac{1}{x}\log a$ (b) ✔ $\frac{1}{x\ln a}$ (c) $\frac{\ln x}{x\ln x}$ (d) $\frac{\ln a}{x\ln x}$

54. $\frac{d}{dx}\ln[f(x)] =$

(a) $f'(x)$ (b) $\ln f'(x)$ (c) ✔ $\frac{f'(x)}{f(x)}$ (d) $f(x).f'(x)$

55. If $y = \log 10^{(ax^2+bx+c)}$ then $\frac{dy}{dx} =$

(a) ✔ $\frac{1}{(ax^2+bx+c)\ln 10}$ (b) $\frac{2ax+b}{(ax^2+bx+c)}$ (c) $10^{ax^2+bx+c}\ \ln 10$ (d) $\frac{2ax+b}{(ax^2+bx+c)\ln a}$

56. $\ln a^e =$

(a) lna (b) ✔ $\frac{1}{lna}$ (c) $\frac{1}{\ln a^e}$ (d) $\ln e^e$

57. If $y = e^{2x}$, then $y_4 =$
(a) ✔ $16e^{2x}$ (b) $8e^{2x}$ (c) $4e^{2x}$ (d) $2e^{2x}$

58. If $f(x) = e^{2x}$, then $f'''(x) =$
(a) $6e^{2x}$ (b) $\frac{1}{6}e^{2x}$ (c) ✔ $8e^{2x}$ (d) $\frac{1}{8}e^{2x}$

59. If $f(x) = x^3 + 2x + 9$ then $f''(x) =$
(a) $3x^2 + 2$ (b) $3x^2$ (c) ✔ $6x$ (d) $2x$

60. If $y = x^7 + x^6 + x^5$ then $D^8(y) =$
(a) 7! (b) $7!\,x$ (c) $7! + 6!$ (d) ✔ 0

61. $1 - x + x^2 - x^3 + x^4 + \cdots . + (-1)^n x^n + \cdots$ is the expansion of
(a) $\frac{1}{1-x}$ (b) ✔ $\frac{1}{1+x}$ (c) $\frac{1}{\sqrt{1-x}}$ (d) $\frac{1}{\sqrt{1+x}}$

62. $f(x) = f(0) + xf'(x) + \frac{x^2}{2!}f''(x) + \frac{x^3}{3!}f'''(x) + \cdots .... + \frac{x^n}{n!}f^n(x) \ldots$ is called____ series.
(a) ✔ Machlaurin's (b) Taylor's (c) Convergent (d) Divergent

63. $1 - x + \frac{x^2}{2!} - \frac{x^3}{3!} + \frac{x^4}{4!} + \ldots\ldots\ldots\ldots$ is an expression of
(a) e^x (b) $Sinx$ (c) ✔ $Cosx$ (d) e^{-x}

64. $a_0 + a_1x + a_2x^2 + \cdots + a_nx^n + \cdots$ is
(a) Maclaurin's series (b) Taylor Series (c) ✔ Power Series (d) Bionomial Serie

65. A function $f(x)$ is such that, at a point $x = c$, $f'(x) > 0$ at $x = c$, then f is said to be
(a) ✔ Increasing (b) decreasing (c) constant (d) 1-1 function

66. A function $f(x)$ is such that, at a point $x = c$, $f'(x) < 0$ at $x = c$, then f is said to be
(a) Increasing (b) ✔ decreasing (c) constant (d) 1-1 function

67. A function $f(x)$ is such that, at a point $x = c$, $f'(x) = 0$ at $x = c$, then f is said to be
(a) Increasing (b) decreasing (c) ✔ constant (d) 1-1 function

68. A stationary point is called _____ if it is either a maximum point or a minimum point
(a) Stationary point (b) ✔ turning point (c) critical point (d) point of inflexion

69. If $f'(c)$ does not change before and after $x = c$, then this point is called______
(a) Stationary point (b) turning point (c) critical poin (d) ✔ point of inflexion

70. Let f be a differentiable function such that $f'(c) = 0$ then if $f'(x)$ changes sign from -iv to +iv i.e., before and after $x = c$, then it occurs relative _____ at $x = c$
(a) Maximum (b) ✔ minimum (c) point of inflexion (d) none

71. Let f be a differentiable function such that $f'(c) = 0$ then if $f'(x)$ does not change sign i.e., before and after $x = c$, then it occurs _____ at $x = c$
(b) Maximum (b) minimum (c) ✔ point of inflexion (d) none

72. Let f be differentiable function in neighborhood of c and $f'(c) = 0$ then $f(x)$ has relative maxima at c if
(a) $f''(c) > 0$ (b) ✔ $f''(c) < 0$ (c) $f''(c) = 0$ (d) $f''(c) \neq 0$

73. If $\int f(x)dx = \varphi(x) + c$, then $f(x)$ is called
(a) Integral (b) differential (c) derivative (d) ✔ integrand

74. Inverse of $\int \ldots . dx$ is:
(a) ✔ $\frac{d}{dx}$ (b) $\frac{dy}{dx}$ (c) $\frac{d}{dy}$ (d) $\frac{dx}{dy}$

75. Differentials are used to find:
(a) ✔ Approximate value (b) exact value (c) Both (a) and (b) (d) None of these

76. $xdy + ydx =$

(a) $d(x+y)$ (b) ✔ $d\left(\frac{x}{y}\right)$ (c) $d(x-y)$ (d) $d(xy)$

77. If $dy = cosxdx$ then $\frac{dx}{dy} =$

(a) $sinx$ (b) $cosx$ (c) $cscx$ (d) ✔ $secx$

78. If $\int f(x)dx = \varphi(x) + c$,then $f(x)$ is called

(b) Integral (b) differential (c) derivative (d) ✔ integrand

79. If $y = f(x)$, then differential of y is

(a) $dy = f'(x)$ (b) ✔ $dy = f'(x)dx$ (c) $dy = f(x)dx$ (d) $\frac{dy}{dx}$

80. The inverse process of derivative is called:

(a) Anti-derivative (b) ✔ Integration (c) Both (a) and (b) (d) None of these

81. If $n \neq 1$, then $\int (ax+b)^n dx =$

(a) $\frac{n(ax+b)^{n-1}}{a} + c$ (b) $\frac{n(ax+b)^{n+1}}{n} + c$ (c) $\frac{(ax+b)^{n-1}}{n+1} + c$ (d) ✔ $\frac{(ax+b)^{n+1}}{a(n+1)} + c$

82. $\int \sin(ax+b)\,dx$=

(a) ✔ $\frac{-1}{a}\cos(ax+b) + c$ (b) $\frac{1}{a}\cos(ax+b) + c$ (c) $a\cos(ax+b) + c$ (d) $-a\cos(ax+b) + c$

83. $\int e^{-\lambda x}dx =$

(a) $\lambda e^{-\lambda x} + c$ (b) $-\lambda e^{-\lambda x} + c$ (c) $\frac{e^{-\lambda x}}{\lambda} + c$ (d) ✔ $\frac{e^{-\lambda x}}{-\lambda} + c$

84. $\int a^{\lambda x}dx =$

(a) $\frac{a^{\lambda x}}{\lambda}$ (b) $\frac{a^{\lambda x}}{lna}$ (c) ✔ $\frac{a^{\lambda x}}{alna}$ (d) $a^{\lambda x}\lambda.\,lna$

85. $\int [f(x)]^n f'(x)dx =$

(a) $\frac{f^n(x)}{n} + c$ (b) $f(x) + c$ (c) ✔ $\frac{f^{n+1}(x)}{n+1} + c$ (d) $nf^{n+1}(x) + c$

86. $\int \frac{f'(x)}{f(x)}dx =$

(a) $f(x) + c$ (b) $f'(x) + c$ (c) ✔ $\ln|x| + c$ (nd) $\ln|f'(x)| + c$

87. $\int \frac{dx}{\sqrt{x+a}+\sqrt{x}}$ can be evaluated if

(a) ✔ $x > 0, a > 0$ (b) $x < 0, a > 0$ (c) $x < 0, a < 0$ (d) $x > 0, a < 0$

88. $\int \frac{x}{\sqrt{x^2+3}}dx =$

(a) ✔ $\sqrt{x^2+3} + c$ (b) $-\sqrt{x^2+3} + c$ (c) $\frac{\sqrt{x^2+3}}{2} + c$ (d) $-\frac{1}{2}\sqrt{x^2+3} + c$

89. $\int \frac{dx}{x\sqrt{x^2-1}} =$

(a) ✔ $Sec^{-1}x + c$ (b) $Tan^{-1}x + c$ (c) $Cot^{-1}x + c$ (d) $Sin^{-1}x + c$

90. $\int \frac{dx}{xlnx} =$

(a) ✔ $\ln lnx + c$ (b) $x + c$ (c) $lnf'(x) + c$ (d) $f'(x)lnf(x)$

91. In $\int (x^2 - a^2)^{\frac{1}{2}}dx$, the substitution is

(a) $x = atan\theta$ (b) ✔ $x = asec\theta$ (c) $x = asin\theta$ (d) $x = 2asin\theta$

92. The suitable substitution for $\int \sqrt{2ax - x^2}dx$ is:

(a) $x - a = acos\theta$ (b) ✔ $x - a = asin\theta$ (c) $x + a = acos\theta$ (d) $x + a = asin\theta$

93. $\int \frac{x+2}{x+1}dx =$

(a) $\ln(x+1) + c$ (b) $\ln(x+1) - x + c$ (c) ✔ $x + \ln(x+1) + c$ (d) None

94. The suitable substitution for $\int \sqrt{a^2 + x^2}dx$ is:

(b) ✔ $x = a\tan\theta$ (b) $x = a\sin\theta$ (c) $x = a\cos\theta$ (d) None of these

95. $\int udv$ equals:
(a) $udu - \int vu$ (b) $uv + \int vdu$ (c) ✔ $uv - \int vdu$ (d) $udu + \int vdu$

96. $\int x\cos x dx =$
(a) $\sin x + \cos x + c$ (b) $\cos x - \sin x + c$ (c) ✔ $x\sin x + \cos x + c$ (d) None

97. $\int \frac{e^{Tan^{-1}x}}{1+x^2} dx =$
(a) $e^{Tanx} + c$ (b) $\frac{1}{2}e^{Tan^{-1}x} + c$ (c) $x\,e^{Tan^{-1}x} + c$ (d) ✔ $e^{Tan^{-1}x} + c$

98. $\int e^x\left[\frac{1}{x} + \ln x\right] =$
(a) $e^x\frac{1}{x} + c$ (b) $-e^x\frac{1}{x} + c$ (c) ✔ $e^x\ln x + c$ (d) $-e^x\ln x + c$

99. $\int e^x\left[\frac{1}{x} - \frac{1}{x^2}\right] =$
(a) ✔ $e^x\frac{1}{x} + c$ (b) $-e^x\frac{1}{x} + c$ (c) $e^x\ln x + c$ (d) $-e^x\frac{1}{x^2} + c$

100. $\int \frac{2a}{x^2-a^2} dx =$
(a) $\frac{x-a}{x+a} + c$ (b) ✔ $\ln\frac{x-a}{x+a} + c$ (c) $\ln\frac{x+a}{x-a} + c$ (d) $\ln|x-a| + c$

101. $\int_{\pi}^{-\pi} \sin x dx =$
(a) ✔ 2 (b) -2 (c) 0 (d) -1

102. $\int_{-1}^{2}|x|dx =$
(a) $\frac{1}{2}$ (b) $-\frac{1}{2}$ (c) $\frac{5}{2}$ (d) ✔ $\frac{3}{2}$

103. $\int_0^1(4x+k)dx = 2$ then $k =$
(a) 8 (b) -4 (c) ✔ 0 (d) -2

104. $\int_0^3 \frac{dx}{x^2+9} =$
(a) $\frac{\pi}{4}$ (b) ✔ $\frac{\pi}{12}$ (c) $\frac{\pi}{2}$ (d) None of these

105. $\int_0^{-\pi} \sin x dx$ equals to:
(a) -2 (b) 0 (c) ✔ 2 (d) 1

106. $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \cos t dt =$
(a) ✔ $\frac{\sqrt{3}}{2} - \frac{1}{2}$ (b) $\frac{\sqrt{3}}{2} + \frac{1}{2}$ (c) $\frac{1}{2} - \frac{\sqrt{3}}{2}$ (d) None

107. $\int_a^a f(x) =$
(a) ✔ 0 (b) $\int_b^a f(x)dx$ (c) $\int_b^a f(x)dx$ (d) $\int_a^a f(x)dx$

108. $\int_0^2 2xdx$ is equal to
(a) 9 (b) 7 (c) ✔ 4 (d) 0

109. To determine the area under the curve by the use of integration , the idea was given by
(a) Newton (b) ✔ Archimedes (c) Leibnitz (d) Taylor

110. The order of the differential equation : $x\frac{d^2y}{dx^2} + \frac{dy}{dx} - 2 = 0$
(a) 0 (b) 1 (c) ✔ 2 (d) more than 2

1. The equation $y = x^2 - 2x + c$ represents (c being a parameter)
111. One parabola (b) ✓ family of parabolas (c) family of line (d) two parabolas

112. Solution of the differential equation : $\frac{dy}{dx} = \frac{1}{\sqrt{1-x^2}}$
(a) ✔ $y = \sin^{-1}x + c$ (b) $y = \cos^{-1}x + c$ (c) $y = \tan^{-1}x + c$ (d) None

113. The general solution of differential equation $\frac{dy}{dx} = -\frac{y}{x}$ is

(a) $\frac{x}{y} = c$ (b) $\frac{y}{x} = c$ (c) ✔ $xy = c$ (d) $x^2y^2 = c$

114. Solution of differential equation $\frac{dv}{dt} = 2t - 7$ is :

(a) $v = t^2 - 7t^3 + c$ (b) $v = t^2 + 7t + c$ (c) $v = t - \frac{7t^2}{2} + c$ (d) ✔ $v = t^2 - 7t + c$

115. The solution of differential equation $\frac{dy}{dx} = sec^2x$ is

(a) $y = cosx + c$ (b) ✔ $y = tanx + c$ (c) $y = sinx + c$ (d) $y = cotx + c$

116. $If\ x < 0, y < 0$ then the point $P(x, y)$ lies in the quadrant

(a) I (b) II (c) ✔ III (d) IV

117. The point P in the plane that corresponds to the ordered pair (x, y) is called:

(a) ✔ $graph\ of\ (x, y)$ (b) mid-point of x, y (c) $abscissa\ of\ x, y$ (d) ordinate of x, y

118. The straight line which passes through one vertex and perpendicular to opposite side is called:

(a) Median (b) ✔ altitude (c) perpendicular bisector (d) normal

119. The point where the medians of a triangle intersect is called_______ of the triangle.

(a) ✔ Centroid (b) centre (c) orthocenter (d) circumference

120. The point where the altitudes of a triangle intersect is called_______ of the triangle.

(a) Centroid (b) centre (c) ✔ orthocenter (d) circumference

121. The centroid of a triangle divides each median in the ration of

(a) ✔ 2:1 (b) 1:2 (c) 1:1 (d) None of these

122. The point where the angle bisectors of a triangle intersect is called_______ of the triangle.

(a) Centroid (b) ✔ in centre (c) orthocenter (d) circumference

123. The two intercepts form of the equation of the straight line is

(a) $y = mx + c$ (b) $y - y_1 = m(x - x_1)$ (c) ✔ $\frac{x}{a} + \frac{y}{b} = 1$ (d) $xcos\alpha + ycos\alpha = p$

124. The Normal form of the equation of the straight line is

(a) $y = mx + c$ (b) $y - y_1 = m(x - x_1)$ (c) $\frac{x}{a} + \frac{y}{b} = 1$ (d) ✔ $xcos\alpha + ycos\alpha = p$

125. In the normal form $xcos\alpha + ycos\alpha = p$ the value of p is

(a) ✔ Positive (b) Negative (c) positive or negative (d) Zero

126. If α is the inclination of the line l then $\frac{x - x_1}{cos\alpha} = \frac{y - y_1}{sin\alpha} = r(say)$

(a) Point-slope form (b) normal form (c) ✔ symmetric form (d) none of these

127. The slope of the line $ax + by + c = 0$ is

(a) $\frac{a}{b}$ (b) ✔ $-\frac{a}{b}$ (c) $\frac{b}{a}$ (d) $-\frac{b}{a}$

128. The slope of the line perpendicular to $ax + by + c = 0$

(a) $\frac{a}{b}$ (b) $-\frac{a}{b}$ (c) ✔ $\frac{b}{a}$ (d) $-\frac{b}{a}$

129. The general equation of the straight line in two variables x and y is

(a) ✔ $ax + by + c = 0$ (b) $ax^2 + by + c = 0$ (c) $ax + by^2 + c = 0$ (d) $ax^2 + by^2 + c = 0$

130. The $x - intercept$ $4x + 6y = 12$ is

(a) 4 (b) 6 (c) ✔ 3 (d) 2

131. The lines $2x + y + 2 = 0$ and $6x + 3y - 8 = 0$ are

(a) ✔ Parallel (b) perpendicular (c) neither (d) non coplanar

132. If φ be an angle between two lines l_1 and l_2 when slopes m_1 and m_2, then angle from l_1 to l_2

(a) $tan\varphi = \frac{m_1 - m_2}{1 + m_{1}m_{2}}$ (b) ✔ $tan\varphi = \frac{m_2 - m_1}{1 + m_{2}m_{1}}$ (c) $tan\varphi = \frac{m_1 + m_2}{1 + m_{1}m_{2}}$ (d) $tan\varphi = \frac{m_2 + m_1}{1 + m_{1}m_{2}}$

133. If φ be an acute angle between two lines l_1 and l_2 when slopes m_1 and m_2, then acute angle from l_1 to l_2

(a) $|tan\varphi = \frac{m_1 - m_2}{1 + m_{1}m_{2}}|$ (b) ✔ $|tan\varphi = \frac{m_2 - m_1}{1 + m_{2}m_{1}}|$ (c) $|tan\varphi = \frac{m_1 + m_2}{1 + m_{1}m_{2}}|$ (d) $|tan\varphi = \frac{m_2 + m_1}{1 + m_{1}m_{2}}|$

134. Two lines l_1 and l_2 with slopes m_1 and m_2 are parallel if

(a) ✔ $m_1 - m_2 = 0$ (b) $m_1 + m_2 = 0$ (c) $m_1 m_2 = 0$ (d) $m_1 m_2 = -1$

135. Two lines l_1 and l_2 with slopes m_1 and m_2 are perpendicular if

(b) $m_1 - m_2 = 0$ (b) $m_1 + m_2 = 0$ (c) $m_1 m_2 = 0$ (d) ✔ $m_1 m_2 = -1$

136. The lines represented by $ax^2 + 2hxy + by^2 = 0$ are orthogonal if

(a) $a - b = 0$ (b) ✔ $a + b = 0$ (c) $a + b > 0$ (d) $a - b < 0$

137. The lines lying in the same plane are called

(a) Collinear (b) ✔ coplanar (c) non-collinear (d) non-coplanar

138. The distance of the point $(3, 7)$ from the $x - axis$ is

(a) ✔7 (b) -7 (c) 3 (d) -3

139. Two lines $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ are parallel if

(a) ✔ $\frac{a_1}{a_2} = \frac{b_1}{b_2}$ (b) $\frac{a_1}{b_1} = -\frac{a_2}{b_2}$ (c) $\frac{a_1}{c_1} = \frac{a_2}{c_2}$ (d) $\frac{b_1}{c_1} = \frac{b_2}{c_2}$

140. The equation $y^2 - 16 = 0$ represents two lines.

(a) ✔Parallel to $x - axis$ (b) Parallel $y - axis$ (c) not || to $x - axis$ (d) not || to $y - axis$

141. The perpendicular distance of the line $3x + 4y + 10 = 0$ from the origin is

(a) 0 (b) 1 (c) ✔2 (d) 3

142. The lines represented by $ax^2 + 2hxy + by^2 = 0$ are orthogonal if

(b) $a - b = 0$ (b) ✔ $a + b = 0$ (c) $a + b > 0$ (d) $a - b < 0$

143. Every homogenous equation of second degree $ax^2 + bxy + by^2 = 0$ represents two straight lines

(a) ✔Through the origin (b) not through the origin (c) two || line (d) two ⊥ar lines

144. The equation $10x^2 - 23xy - 5y^2 = 0$ is homogeneous of degree

(a) 1 (b) ✔ 2 (c) 3 (d) more than 2

145. The equation $y^2 - 16 = 0$ represents two lines.

(a) ✔Parallel to $x - axis$ (b) Parallel $y - axis$ (c) not || to $x - axis$ (d) not || to $y - axis$

146. (0,0) is satisfied by

(a) $x - y < 10$ (b) $2x + 5y > 10$ (c) ✔ $x - y \geq 13$ (d) None

147. The point where two boundary lines of a shaded region intersect is called ____ point.

(a) Boundary (b) ✔ corner (c) stationary (d) feasible

148. If $x > b$ then

(a) $-x > -b$ (b) $-x < b$ (c) $x < b$ (d) ✔ $-x < -b$

149. The symbols used for inequality are

(a) 1 (b) 2 (c) 3 (d) ✔4

150. An inequality with one or two variables has ______ solutions.

(a) One (b) two (c) three (d) ✔infinitely many

151. $ax + by < c$ is not a linear inequality if

(a) ✔ $a = 0, b = 0$ (b) $a \neq 0, b \neq 0$ (c) $a = 0, b \neq 0$ (d) $a \neq 0, b = 0, c = 0$

152. The graph of corresponding linear equation of the linear inequality is a line called______

(a) ✔Boundary line (b) horizontal line (c) vertical line (d) inclined line

1. The graph of a linear equation of the form $ax + by = c$ is a line which divides the whole plane into _____ disjoints parts.

(a) ✔Two (b) four (c) more than four (d) infinitely many

153. The graph of the inequality $x \leq b$ is

(a) Upper half plane (b) lower half plane (c) ✔ left half plane (d) right half plane

154. The graph of the inequality $y \leq b$ is

(b) Upper half plane (b) ✔ lower half plane (c) left half plane (d) right half plane

155. The feasible solution which maximizes or minimizes the objective function is called

(a) Exact solution (b) ✔ optimal solution (c) final solution (d) objective function

156. Solution space consisting of all feasible solutions of system of linear in inequalities is called

(a) Feasible solution (b) Optimal solution (c) ✔ Feasible region (d) General solution

157. Corner point is also called

(a) Origin (b) Focus (c) ✔ Vertex (d) Test point

158. For feasible region:

(a) ✔ $x \geq 0, y \geq 0$ (b) $x \geq 0, y \leq 0$ (c) $x \leq 0, y \geq 0$ (d) $x \leq 0, y \leq 0$

159. $x = 0$ is in the solution of the inequality

(a) $x < 0$ (b) $x + 4 < 0$ (c) ✔ $2x + 3 > 0$ (d) $2x + 3 < 0$

160. Linear inequality $2x - 7y > 3$ is satisfied by the point

(a) (5,1) (b) (-5,-1) (c) (0,0) (d) ✔ (1,-1)

161. The non-negative constraints are also called

(a) ✔ Decision variable (b) Convex variable (c) Decision constraints (d) concave variable

1. If the line segment obtained by joining any two points of a region lies entirely within the region , then the region is called

(a) Feasible region (b) ✔ Convex region (c) Solution region (d) Concave region

162. A function which is to be maximized or minimized is called:

(a) Linear function (b) ✔ Objective function (c) Feasible function (d) None of these

163. For optimal solution we evaluate the objective function at

(a) Origen (b) Vertex (c) ✔ Corner Points (d) Convex points

164. We find corner points at

(a) Origen (b) Vertex (c) ✔ Feasible region (d) Convex region

165. The set of points which are equal distance from a fixed point is called:

(a) ✔ Circle (b) Parabola (c) Ellipse (d) Hyperbola

166. The circle whose radius is zero is called:

(a) Unit circle (b) ✔ point circle (c) circumcircle (d) in-circle

167. The circle whose radius is 1 is called:

(a) ✔ Unit circle (b) point circle (c) circumcircle (d) in-circle

168. The equation $x^2 + y^2 + 2gx + 2fy + c = 0$ represents the circle with centre

(a) (g, f) (b) ✔ $(-g, -f)$ (c) $(-f, -g)$ (d) $(g, -f)$

169. The equation $x^2 + y^2 + 2gx + 2fy + c = 0$ represents the circle with centre

(a) ✔ $\sqrt{g^2 + f^2 - c}$ (b) $\sqrt{g^2 + f^2 + c}$ (c) $\sqrt{g^2 + c^2 - f}$ (d) $\sqrt{g + f - c}$

170. The ratio of the distance of a point from the focus to distance from the directrix is denoted by

(a) ✔ r (b) R (c) E (d) e

171. Standard equation of Parabola is :

(a) $y^2 = 4a$ (b) $x^2 + y^2 = a^2$ (c) ✔ $y^2 = 4ax$ (d) $S = vt$

172. The focal chord is a chord which is passing through

(a) ✔ Vertex (b) Focus (c) Origin (d) None of these

173. The curve $y^2 = 4ax$ is symmetric about

(a) ✔ $y - axis$ (b) $x - axis$ (c) Both (a) and (b) (d) None of these

174. Latusrectum of $x^2 = -4ay$ is

(a) $x = a$ (b) $x = -a$ (c) $y = a$ (d) ✔ $y = -a$

175. Eccentricity of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is

(a) $\frac{a}{c}$ (b) ac (c) ✔ $\frac{c}{a}$ (d) None of these

176. Focus of $y^2 = -4ax$ is

(a) $(0, a)$ (b) ✔ $(-a, 0)$ (c) $(a, 0)$ (d) $(0, -a)$

177. A type of the conic that has eccentricity greater than 1 is

(a) An ellipse (b) A parabola (c) ✔ A hyperbola (d) A circle

178. $x^2 + y^2 = -5$ represents the

(a) Real circle (b) ✔Imaginary circle (c) Point circle (d) None of these

179. Which one is related to circle

(a) $e = 1$ (b) $e > 1$ (c) $e < 1$ (d) ✔$e = 0$

180. Circle is the special case of :

(a) Parabola (b) Hyperbola (c) ✔Ellipse (d) None of these

181. Equation of the directrix of $x^2 = -4ay$ is:

(a) $x + a = 0$ (b) $x - a = 0$ (c) $y + a = 0$ (d) ✔ $y - a = 0$

182. The midpoint of the foci of the ellipse is its

(a) Vertex (b) ✔ Centre (c) Directrix (d) None of these

183. Focus of the ellipse always lies on the

(a) Minor axis (b) ✔Major axi (c) Directrix (d) None of these

184. Length of the major axis of $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, $a > b$ is

(a) ✔$2a$ (b) $2b$ (c) $\frac{2b^2}{a}$ (d) None of these

185. In the cases of ellipse it is always true that:

(a) ✔$a^2 > b^2$ (b) $a^2 < b^2$ (c) $a^2 = b^2$ (d) $a < 0, b < 0$

186. Two conics always intersect each other in _____ points

(a) No (b) one (c) two (d) ✔ four

187. The eccentricity of ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$ is

(a) ✔ $\frac{\sqrt{7}}{4}$ (b) $\frac{7}{4}$ (c) 16 (d) 9

188. The foci of an ellipse are $(4, 1)$ and $(0, 1)$ then its centre is:

(a) (4,2) (b) ✔(2,1) (c) (2,0) (d) (1,2

189. The foci of hyperbola always lie on :

(a) $x - axis$ (b) ✔ $Transverse\ axi$s (c) $y - axis$ (d) Conjugate axis

190. Length of transverse axis of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is

(a) ✔$2a$ (b) $2b$ (c) a (d) b

191. $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is symmetric about the:

(a) $y - axis$ (b) $x - axis$ (c) ✔Both (a) and (b) (d) None of these

1. Two vectors are said to be negative of each other if they have the same magnitude and ___________direction.

(a) Same (b) ✔ opposite (c) negative (d) parallel

192. Parallelogram law of vector addition to describe the combined action of two forces, was used by

(a) Cauchy (b) ✔ Aristotle (c) Alkhwarzmi (d) Leibnitz

193. The vector whose initial point is at the origin and terminal point is P , is called

(a) Null vector (b) unit vector (c) ✔position vector (d) normal vector

194. If R be the set of real numbers, then the Cartesian plane is defined as

(a) $R^2 = \{(x^2, y^2): x, y \in R\}$ (b) ✔ $R^2 = \{(x, y): x, y \in R\}$ (c) $R^2 = \{(x, y): x, y \in R, x = -y\}$ (d) $R^2 = \{(x, y): x, y \in R, x = y\}$

195. The element $(x, y) \in R^2$ represents a

(a) Space (b) ✔ point (c) vector (d) line

196. If $\underline{u} = [x, y]$ in R^2, then $|\underline{u}| =?$

(a) $x^2 + y^2$ (b) ✔ $\sqrt{x^2 + y^2}$ (c) $\pm\sqrt{x^2 + y^2}$ (d) $x^2 - y^2$

197. If $|\underline{u}| = \sqrt{x^2 + y^2} = 0$, then it must be true that

(a) $x \geq 0, y \geq 0$ (b) $x \leq 0, y \leq 0$ (c) $x \geq 0, y \leq 0$ (d) ✔ $x = 0, y = 0$

198. Each vector $[x, y]$in R^2 can be uniquely represented as

(a) $x\underline{i} - y\underline{j}$ (b) ✔ $x\underline{i} + y\underline{j}$ (c) $x + y$ (d) $\sqrt{x^2 + y^2}$

199. The lines joining the mid-points of any two sides of a triangle is always ____to the third side.

(a) Equal (b) ✔ Parallel (c) perpendicular (d) base

200. If $\underline{u} = 3\underline{i} - \underline{j} + 2\underline{k}$ then [3,-1,2] are called _________ of $\underline{u}$.

(a) Direction cosines (b) ✔ direction ratios (c) direction angles (d) elements

201. Which of the following can be the direction angles of some vector

(a) $45°, 45°, 60°$ (b) $30°, 45°, 60°$ (c) ✔$45°, 60°, 60°$ (d) obtuse

202. Measure of angle θ between two vectors is always.

(a) $0 < \theta < \pi$ (b) $0 \leq \theta \leq \frac{\pi}{2}$ (c) ✔$0 \leq \theta \leq \pi$ (d) obtuse

203. If the dot product of two vectors is zero, then the vectors must be

(a) Parallel (b) ✔ orthogonal (c) reciprocal (d) equal

204. If the cross product of two vectors is zero, then the vectors must be

(a) ✔ Parallel (b) orthogonal (c) reciprocal (d) Non coplanar

205. If θ be the angle between two vectors $\underline{a}$ and $\underline{b}$, then $cos\theta =$

(a) $\frac{\underline{a}\times\underline{b}}{|\underline{a}||\underline{b}|}$ (b) ✔ $\frac{\underline{a}.\underline{b}}{|\underline{a}||\underline{b}|}$ (c) $\frac{\underline{a}.\underline{b}}{|\underline{a}|}$ (d) $\frac{\underline{a}.\underline{b}}{|\underline{b}|}$

206. If θ be the angle between two vectors $\underline{a}$ and $\underline{b}$, then projection of $\underline{b}$ along $\underline{a}$ is

(a) $\frac{\underline{a}\times\underline{b}}{|\underline{a}||\underline{b}|}$ (b) $\frac{\underline{a}.\underline{b}}{|\underline{a}||\underline{b}|}$ (c) ✔ $\frac{\underline{a}.\underline{b}}{|\underline{a}|}$ (d) $\frac{\underline{a}.\underline{b}}{|\underline{b}|}$

207. If θ be the angle between two vectors $\underline{a}$ and $\underline{b}$, then projection of $\underline{a}$ along $\underline{b}$ is

(a) $\frac{\underline{a}\times\underline{b}}{|\underline{a}||\underline{b}|}$ (b) $\frac{\underline{a}.\underline{b}}{|\underline{a}||\underline{b}|}$ (c) $\frac{\underline{a}.\underline{b}}{|\underline{a}|}$ (d) ✔ $\frac{\underline{a}.\underline{b}}{|\underline{b}|}$

208. Let $\underline{u} = a\underline{i} + b\underline{j} + c\underline{k}$ then projection of $\underline{u}$ along $\underline{i}$ is

(a) ✔a (b) b (c) c (d) u

209. In any ΔABC, the law of cosine is

(a) ✔$a^2 = b^2 + c^2 - 2bcCosA$ (b) $a = bCosC + cCosB$ (c) $a.b = 0$ (d) $a - b = 0$

210. In any ΔABC, the law of projection is

(a) $a^2 = b^2 + c^2 - 2bcCosA$ (b) ✔ $a = bCosC + cCosB$ (c) $a.b = 0$ (d) $a - b = 0$

211. If $\underline{u}$ is a vector such that $\underline{u}.\underline{i} = 0, \underline{u}.\underline{j} = 0, \underline{u}.\underline{k} = 0$ then $\underline{u}$ is called

(a) Unit vector (b) ✔ null vector (c) $[\underline{i}, \underline{j}, \underline{k}]$ (d) none of these

212. Cross product or vector product is defined

(a) In plane only (b) ✔in space only (c) everywhere (d) in vector field

213. If $\underline{u}$ and $\underline{v}$ are two vectors , then $\underline{u} \times \underline{v}$ is a vector

(a) Parallel to $\underline{u}$and $\underline{v}$ (b) parallel to $\underline{u}$ (c) ✔ perpendicular to $\underline{u}$ and $\underline{v}$ (d) orthogonal to $\underline{u}$

214. If $\underline{u}$ and $\underline{v}$ be any two vectors, along the adjacent sides of ||gram then the area of ||gram is

(a) $\underline{u} \times \underline{v}$ (b) ✔ $|\underline{u} \times \underline{v}|$ (c) $\frac{1}{2}(\underline{u} \times \underline{v})$ (d) $\frac{1}{2}|\underline{u} \times \underline{v}|$

215. If $\underline{u}$ and $\underline{v}$ be any two vectors, along the adjacent sides of triangle then the area of triangle is

(a) $\underline{u} \times \underline{v}$ (b) $|\underline{u} \times \underline{v}|$ (c) $\frac{1}{2}(\underline{u} \times \underline{v})$ (d) ✔ $\frac{1}{2}|\underline{u} \times \underline{v}|$

216. The scalar triple product of $\underline{a}$,$\underline{b}$ and $\underline{c}$ is denoted by

(a) $\underline{a}.\underline{b}.\underline{c}$ (b) ✔ $\underline{a}.\underline{b} \times \underline{c}$ (c) $\underline{a} \times \underline{b} \times \underline{c}$ (d) $(\underline{a} + \underline{b}) \times \underline{c}$

217. Cross product or vector product is defined

(b) In plane only (b) ✔ in space only (c) everywhere (d) in vector field

218. If $\underline{u}$ and $\underline{v}$ are two vectors , then $\underline{u} \times \underline{v}$ is a vector

(b) Parallel to $\underline{u}$and $\underline{v}$ (b) parallel to $\underline{u}$ (c) ✔ perpendicular to $\underline{u}$ and $\underline{v}$ (d) orthogonal to $\underline{u}$

219. If $\underline{u}$ and $\underline{v}$ be any two vectors, along the adjacent sides of ||gram then the area of ||gram is

(b) $\underline{u} \times \underline{v}$ (b) ✔ $|\underline{u} \times \underline{v}|$ (c) $\frac{1}{2}(\underline{u} \times \underline{v})$ (d) $\frac{1}{2}|\underline{u} \times \underline{v}|$

220. If $\underline{u}$ and $\underline{v}$ be any two vectors, along the adjacent sides of triangle then the area of triangle is

(b) $\underline{u} \times \underline{v}$ (b) $|\underline{u} \times \underline{v}|$ (c) $\frac{1}{2}(\underline{u} \times \underline{v})$ (d) ✔ $\frac{1}{2}|\underline{u} \times \underline{v}|$

221. Two non zero vectors are perpendicular iff

(a) $\underline{u}.\underline{v} = 1$ (b) $\underline{u}.\underline{v} \neq 1$ (c) $\underline{u}.\underline{v} \neq 0$ (d) ✔ $\underline{u}.\underline{v} = 0$

222. The scalar triple product of $\underline{a}$,$\underline{b}$ and $\underline{c}$ is denoted by

(b) $\underline{a}.\underline{b}.\underline{c}$ (b) ✔ $\underline{a}.\underline{b} \times \underline{c}$ (c) $\underline{a} \times \underline{b} \times \underline{c}$ (d) $(\underline{a} + \underline{b}) \times \underline{c}$

223. The vector triple product of $\underline{a}$,$\underline{b}$ and $\underline{c}$ is denoted by

(a) $\underline{a}.\underline{b}.\underline{c}$ (b) $\underline{a}.\underline{b} \times \underline{c}$ (c) ✔ $\underline{a} \times \underline{b} \times \underline{c}$ (d) $(\underline{a} + \underline{b}) \times \underline{c}$

224. Notation for scalar triple product of $\underline{a}$,$\underline{b}$ and $\underline{c}$ is

(a) $\underline{a}.\underline{b} \times \underline{c}$ (b) $\underline{a} \times \underline{b}.\underline{c}$ (c)$[\underline{a}.\underline{b}.\underline{c}]$ (d) ✔ all of these

225. If the scalar product of three vectors is zero, then vectors are

(a) Collinear (b) ✔ coplanar (c) non coplanar (d) non-collinear

226. If any two vectors of scalar triple product are equal, then its value is equal to

(a) 1 (b) ✔0 (c) -1 (d) 2

227. Moment of a force $\underline{F}$ about a point is given by:

(a) Dot product (b) ✔cross product (c) both (a) and (b) (d) None of these

Short Questions

1) (i) $x = at^2, y = 2at$ represent the equation of parabola $y^2 = 4ax$
2) Express the perimeter P of square as a function of its area A.
3) Show that $x = a\cos\theta$, $y = b\sin\theta$ represent the equation of ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$
4) Show that: $\sinh 2x = 2\sinh x\cosh x$
   Express the volume V of a cube as a function of the area A of its base.
5) Find $\frac{f(a+h)-f(a)}{h}$ and simplify $f(x) = \cos x$
6) $f(x) = \frac{1}{\sqrt{x-1}}, x \neq 1$; $g(x) = (x^2+1)^2$
7) (a) $f^{-1}(x)$ (b) $f^{-1}(-1)$ and verify $f(f^{-1}(x)) = f^{-1}f(x)) = xf(x) = \frac{2x+1}{x-1}, x > 1$
8) Show that $\lim_{x\to 0} \frac{a^x-1}{x} = \log_e a$
9) Evaluate $\lim_{x\to 0} \frac{Sin7x}{x}$
10) Evaluate $\lim_{n\to +\infty} \left(1+\frac{1}{n}\right)^{\frac{n}{2}}$
11) $\text{Lim}_{h\to 0} \frac{\sqrt{x+h}-\sqrt{x}}{h}$
12) $\text{Lim}_{x\to 0}(1+2x^2)^{\frac{1}{x^2}}$
13) Evaluate $\lim_{\theta\to 0} \frac{1-\cos\theta}{\theta}$
14) Evaluate $\lim_{x\to 0} \frac{x^n-a^n}{x^m-a^m}$
15) $\text{Lim}_{x\to 0} \frac{e^{1/x}-1}{e^{1/x}+1}, x > 0$

16) (i) $\text{Lim}_{x\to 0}\frac{\sin x^0}{x}$ (ii) $\text{Lim}_{\theta\to 0}\frac{1-\cos\theta}{\sin\theta}$ (iii) $\text{Lim}_{x\to 0}\frac{\text{sinax}}{\sin bx}$

17) Discuss the continuity of the function at $x = 3$ $g(x) = \frac{x^2-9}{x-3}\ if\ x \neq 3$

18) Discuss the continuity of $f(x)$ at $x = c$: $f(x) = \begin{cases}2x+5\ if\ x \leq 2\\4x+1\ if\ x > 2\end{cases}, c = 2$

19) Discuss the continuity of $f(x)$ at 3, when $f(x) = \begin{cases}x-1,\ if\ x \leq 3\\2x+1\ if\ 3 \leq x\end{cases}$

20) Find the derivative of the given function by definition $f(x) = x^2$

21) Find the derivative of the given function by definition $f(x) = \frac{1}{\sqrt{x}}$

22) Find the derivative of $y = (2\sqrt{x}+2)(x-\sqrt{x})\ w.r.t\ 'x'$

23) Differentiate $\frac{2x^3-3x^2+5}{x^2+1}\ w.r.t\ 'x'$

24) If $x^4 + 2x^2 + 2$, Prove that $\frac{dy}{dx} = 4x\sqrt{y-1}$

25) Differentiate$\left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)^2 w.r.t\ 'x'$.

26) Differentiate $(x-5)(3-x)$

27) Find $\frac{dy}{dx}$ if $x = \theta + \frac{1}{\theta}, y = \theta + 1$

28) Find $\frac{dy}{dx}$ by making some suitable substitution if $y = \sqrt{x+\sqrt{x}}$

29) Differentiate $x^2 + \frac{1}{x^2}\ w.r.t\ x - \frac{1}{x}$

30) Find $\frac{dy}{dx}$ if $y^2 - xy - x^2 + 4 = 0$

31) Find $\frac{dy}{dx}$ if $x^2 + y^2 = 4$

32) Find $\frac{dy}{dx}$ if $y = x^n$ where $n = \frac{p}{q}, q \neq 0$

33) If $y = (ax+b)^n$ where n is negative integer , find $\frac{dy}{dx}$ using quotient theorem.

34) Find $\frac{dy}{dx}$ if $xy + y^2 = 2$

35) Differentiate $(1+x^2)\ w.r.t\ x^2$

36) Find $\frac{dy}{dx}$ if $3x + 4y + 7 = 0$

37) Find $\frac{dy}{dx}\ if\ y = xcosy$

38) Differentiate $sin^2x\ \ w.r.t\ cos^2x$

39) Find $f'(x)$ if $f(x) = ln(e^x + e^{-x})$

40) Find $f'(x)$ if $f(x) = e^x\,(1 + lnx)$

41) Differentiate $(lnx)^x\ w.r.t\ 'x'$

42) Find $\frac{dy}{dx}$ if $y = a^{\sqrt{x}}$

43) Find $\frac{dy}{dx}$ if $y = 5e^{3x-4}$

44) Find $\frac{dy}{dx}$ if $y = (x+1)^x$

45) Find $\frac{dy}{dx}$ if $y = xe^{sinx}$

46) Find $\frac{dy}{dx}$ if $y = (ln\ tanhx)$

47) Find $\frac{dy}{dx}$ if $y = sinh^{-1}(\frac{x}{2})$

48) Find $\frac{dy}{dx}$ if $y = tanh^{-1}(sinx)\quad , -\frac{\pi}{2} < x < \frac{\pi}{2}$

49) If $y = Sin^{-1}\frac{x}{a}$, then show that $y_2 = x(a^2-x^2)^{-\frac{3}{2}}$

50) Find y_2 if $y = x^2.e^{-x}$

51) Find y_2 if $x = acos\theta, y = sin\theta$

52) Find y_2 if $x^3 - y^3 = a^3$
53) Find the first four derivatives of $cos(ax + b)$
54) Apply Maclaurin's Series expansion to prove that $e^{2x} = 1 + 2x + \frac{4x^2}{2!} + \frac{8x^3}{3!} + \cdots$
55) Apply Maclaurin's Series expansion to prove that $e^x = 1 + x + \frac{x^2}{2!} + \cdots$
56) State Taylor's series expansion.
57) Expand $cosx$ by Maclaurin's series expansion.
58) Define Increasing and decreasing functions.
59) Determine the interval in which $f(x) = x^2 + 3x + 2; x \in [-4, 1]$
60) Determine the interval in which $f(x) = Cosx\ ; x \in \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$
61) Find the extreme values of the function $f(x) = 3x^2 - 4x + 5$
62) Find the extreme values of the function $f(x) = 1 + x^3$
63) Find δy and dy if $y = x^2 + 2x$ when x changes from 2 to 1.8
64) Use differentials find $\frac{dy}{dx}$ and $\frac{dx}{dy}$ in the following equations.
65) $xy + x = 4$ (b) $xy - lnx = c$
66) Find the approximate increase in the volume of a cube if the length of its each edge changes from 5 to 5.02
67) Find the approximate increase in the area of a circular disc if its diameter is increased form 44cm to 44.4cm.
68) Define integration.
69) Evaluate $\int\left(\sqrt{x} + 1\right)^2 dx$
70) Evaluate $\int \frac{\sqrt{y}(y+1)}{y} dx$
71) Evaluate $\int \frac{3-cos2x}{1+cos2x} dx$
72) Evaluate $\int x\sqrt{x^2 - 1}\, dx$
73) Prove that $\int[f(x)^n f'(x)dx = \frac{[f(x)]^{n+1}}{n+1} + c\ , n \neq -1$
74) Evaluate $\int \frac{(1+e^x)^3}{e^x} dx$
75) Evaluate $\int (lnx) \times \frac{1}{x} dx$
76) Evaluate $\int \frac{sinx + cos^3x}{cos^2x\, sinx} dx$
77) Evaluate $\int \frac{1-x^2}{1+x^2} dx$
78) Evaluate $\int \frac{cos2x-1}{1+cos2x} dx$
79) Evaluate $\int \sqrt{1 - cos2x}\, dx$
80) Evaluate $\int (a - 2x)^{\frac{3}{2}} dx$
81) Evaluate $\int \frac{1}{xlnx} dx$
82) Evaluate $\int \frac{x^2}{4+x^2} dx$
83) Evaluate $\int \frac{e^x}{e^x+3} dx$
84) Evaluate $\int \frac{sec^2x}{\sqrt{tanx}} dx$
85) Evaluate $\int \frac{cosx}{sinx\, lnsinx} dx$
86) Evaluate $\int \frac{\sqrt{2}}{sinx+cosx} dx$
87) Evaluate $\int cosx \left(\frac{lnsinx}{sinx}\right) dx$
88) Evaluate $\int \frac{dx}{x(ln2x)^3}, (x > 0)$

89) Find $\int a^{x^2}.xdx$, $(a > 0, a \neq 1)$
90) Evaluate $\int \frac{1}{(1+x^2)Tan^{-1}x}dx$
91) Evaluate $\int lnxdx$
92) Evaluate $\int x^3 lnxdx$
93) Evaluate $\int xTan^{-1}x\,dx$
94) Evaluate $\int \frac{xSin^{-1}x}{\sqrt{1-x^2}}dx$
95) Evaluate $\int x^2 e^{ax}dx$
96) Evaluate $\int tan^4 x$
97) Evaluate $\int \frac{e^{mTan^{-1}x}}{(1+x^2)}dx$
98) Evaluate $\int e^x\left(\frac{1}{x}+lnx\right)dx$
99) Evaluate $\int \left(\frac{1-sinx}{1-cosx}\right)e^x dx$
100)
101) Evaluate $\int \frac{2a}{a^2-x^2}dx$
102) Evaluate $\int \frac{5x+8}{(x+3)(2x-1)}dx$
103) Evaluate $\int \frac{(a-b)x}{(x-a)(x-b)}dx$
104) Evaluate $\int_0^3 \frac{dx}{x^2+9}$
105) Evaluate $\int_1^2 \frac{x}{x^2+2}dx$
106) Evaluate $\int_1^2 lnxdx$
107) Evaluate $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} costdt$
108) Evaluate $\int_0^{\frac{\pi}{6}} xcosxdx$
109) Evaluate $\int_0^2 (e^{\frac{x}{2}} - e^{-\frac{x}{2}})dx$
110) Evaluate $\int_{-1}^5 |x-3|dx$
111) Evaluate $\int_{-2}^1 \frac{1}{(2x-1)^2}dx$
112) Evaluate $\int_2^3 \left(x-\frac{1}{x}\right)^2 dx$
113) Evaluate $\int_1^2 \left(x+\frac{1}{x}\right)^{\frac{1}{2}}\left(1-\frac{1}{x^2}\right)dx$
114) Find the area bounded by the curve $y = x^3 + 3x^2$ and the $x-axis$.
115) Find the area between the $x-axis$ and the curve $y^2 = 4 - x$ in the first quadrant from $x = 0$ to $x = 3$.
116) Find the area bounded by cos function from $y = -\frac{\pi}{2}$ to $\frac{\pi}{2}$.
117) Find the area between the $x-axis$ and the curve $y = cos\frac{1}{2}x$ form $-\pi$ to π.
118) Solve $\frac{dy}{dx} = \frac{y^2+1}{e^{-x}}$
119) Solve $\frac{1}{x}\frac{dy}{dx} - 2y = 0$
120) Solve $\frac{dy}{dx} = \frac{3}{4}x^2 + x - 3$, if $y = 0$ and $x = 2$
121) Solve $\frac{dy}{dx} = \frac{y}{x^2}$, $(y > 0)$
122) Solve $\frac{dy}{dx} = \frac{1-y}{y}$
123) Solve $(e^x + e^{-x})\frac{dy}{dx} = e^x - e^{-x}$

124) Solve $secx + tany\frac{dy}{dx} = 0$

125) Solve $1 + cosx\ tany\frac{dy}{dx} = 0$

126) Solve $\frac{dy}{dx} = -y$

127) Show that the points $A(3,1), B(-2,-3)$ and $C(2,2)$ are vertices of an isosceles triangle.

128) Find the mid-point of the line segment joining the vertices $A(-8,3), B(2,-1)$.

129) Show that the vertices $(-1,2)$, $B(7,5), C(2,-6)$ are vertices of a right triangle.

130) Find the points trisecting the join of $A(-1,-4)$ and $B(6,2)$.

131) Find h such that $(-1,h)$, $B(3,2), and\ C(7,3)$ are collinear.

132) Describe the location in the plane of point $P(x,y)$ for whcih $x = y$.

133) The point $C(-5,3)$ is the centre of a circle and $P(7,-2)$ lies on the circle. What is the radius of the circle?

134) Find the point three-fifth of the way along the line segment from $A(-5,8)$ to $B(5,3)$.

135) The two points P and O' are given in xy −coordinate system. Find the XY-coordinates of P referred to the translated axes $O'X$ and $O'Y$ if $P(-2,6)$ and $O'(-3,2)$.

136) The xy-coordinate axes are translated through point O' whose coordinates are given in xy −coodinate system. The coordinates of P are given in the XY −coodinate system. Find the coordinates of P in xy-coordiante system if $(-5,-3)$, $O'(-2,3)$.

137) What are translated axes.

138) Show that the points $A(-3,6), B(3,2)$ and $C(6,0)$ are collinear.

139) Find an equation of the straight line if its slope is 2 and $y - axis$ is 5.

140) Find the slope and inclination of the line joining the points $(-2,4); (5,11)$

141) Find k so that the line joining $A(7,3); B(k,-6)$ and the line joining $C(-4,5); D(-6,4)$ are perpendicular.

142) Find an equation of the line bisecting the I and III quadrants.

143) Find an equation of the line for $x - intercept: -3$ and $y - intercept: 4$

144) Find the distance from the point $P(6,-1)$ to the line $6x - 4y + 9 = 0$

145) Find whether the given point $(5,8)$ lies above or below the line $2x - 3y + 6 = 0$

146) Check whether the lines are concurrent or not. $3x - 4y - 3 = 0; 5x + 12y + 1 = 0 ; 32x + 4y - 17 = 0$

147) Transform the eqution $5x - 12y + 39 = 0$ to "Two-intercept form".

148) Find the point of intersection of the lines $x - 2y + 1 = 0$ and $2x - y + 2 = 0$

149) Find an equation of the line through the point $(2,-9)$ and the intersection of the lines $2x + 5y - 8 = 0$ and $3x - 4y - 6 = 0$.

150) Determine the value of p such that the lines $2x - 3y - 1 = 0, 3x - y - 5 = 0$ and $3x + py + 8 = 0$ meet at a point.

151) Find the angle measured from the line l_1 to the line l_2 where l_1: Joining $(2,7)$ and $(7,10)$ l_2: Joining $(1,1)$ and $(-5,5)$

152) Express the given system of equations in matrix form $2x + 3y + 4 = 0; x - 2y - 3 = 0; 3x + y - 8 = 0$

153) Find the angle from the line with slope $-\frac{7}{3}$ to the line with slope $\frac{5}{2}$.

154) Find an equation of each of the lines represented by $20x^2 + 17xy - 24y^2 = 0$

155) Define Homogenous equation.

156) Write down the joint equation.

157) Find a joint equation of the straight lines through the origin perpendicular to the lines represented by $x^2 + xy - 6y^2 = 0$.

158) Find measure of angle between the lines represented by $x^2 - xy - 6y^2 = 0$.

159) Define "Corner Point" or "Vertex".

160) Graph the solution set of linear inequality $3x + 7y \geq 21$.

161) Indicate the solution set of $3x + 7y \geq 21$; $x - y \leq 2$

162) What is "Corresponding equation".

163) Graph the inequality $x + 2y < 6$.
164) Graph the feasible region of $x + y \le 5$; $-2x + y \le 0$ $x \ge 0; y \ge 0$
165) Graph the feasible region of $5x + 7y \le 35; x - 2y \le 4$ $x \ge 0; y \ge 0$
166) Define "Feasible region".
167) Graph the feasible region of $2x - 3y \le 6; 2x + y \ge 2$ $x \ge 0; y \ge 0$
168) Write the equation of the circle with centre $(-3, 5)$ and radius.
169) Find the equation of the circle with ends of a diameter at $(-3, 2)$ and $(5, -6)$.
170) Find the centre and radius of the circle of $x^2 + y^2 + 12x - 10y = 0$
171) Analyze the parabola $x^2 = -16y$
172) Write an equation of the parabola with given elements
Focus $(-3, 1)$; directrix $x = 3$ directrix $x = -2$, Focus $(2, 2)$
173) Directrix $= 3$; vertex $(2, 2)$
174) Analyze the equation $4x^2 + 9y^2 = 36$
175) Find the equation of the ellipse with given data :
176) Foci $(\pm 3, 0)$ and minor axis of length 10
177) Vertices – $1, 1), (5, 1)$; Foci $(4, 1)$ and $(0, 1)$
178) Centre $(0, 0)$, focus $(0, -3)$, vertex $(0, 4)$
179) Find the centre , foci , eccentricity , vertices and directrices of the ellipse whose equations are given :
$9x^2 + y^2 = 18$, $25x^2 + 9y^2 = 225$
180) Discuss $25x^2 - 16y^2 = 400$
181) Find the equation of hyperbola with given data : Foci $(\pm 5, 0)$, vertex $(3, 0)$
182) Foci $(0, \pm 6), e = 2$, Foci $(5, -2), (5, 4)$ and one vertex $(5, 3)$
183) Find the centre ,foci , eccentricity , vertices and directrix of $x^2 - y^2 = 9$
184) $\frac{y^2}{4} - x^2 = 1$, $\frac{y^2}{16} - \frac{x^2}{9} = 1$
185) Find equations of the common tangents to the two conics $\frac{x^2}{16} + \frac{y^2}{25} = 1$ and $\frac{x^2}{25} + \frac{y^2}{9} = 1$
186) Find the points of intersection of the ellipse $\frac{x^2}{\frac{43}{3}} + \frac{y^2}{\frac{43}{4}} = 1$ and the hyperbola $\frac{x^2}{7} - \frac{y^2}{14} = 1$
187) Find the points of intersection of the conics $x^2 + y^2 = 8$ and $x^2 - y^2 = 1$
188) Find equations of the common tangents to the given conics $y^2 = 16x$ and $x^2 = 2y$
189) Find equations of the tangents to the conic $9x^2 - 4y^2 = 36$ parallel to $5x - 2y + 7 = 0$
190) Transform the equation $x^2 + 6x - 8y + 17 = 0$ referred to the origin $O'(-3, 1)$ as origin, axes remaining parallel to the old axes.
191) Find an equation of $5x^2 - 6xy + 5y^2 - 8 = 0$ with respect to new axes obtained by rotation of axes about the origin through an angle of $135°$.
192) Write the vector $\overrightarrow{PQ}$ in the form of $x\underline{i} + y\underline{j}$ if $P(2, 3), Q(6, -2)$
193) Find the sum of the vectors $\overrightarrow{AB}$ and $\overrightarrow{CD}$, given the four points $A(1, -1), B(2, 0), C(-1, 3)$ and $D(-2, 2)$
194) Find the unit vector in the direction of vector given $\underline{v} = \frac{1}{2}\underline{i} + \frac{\sqrt{3}}{2}\underline{j}$
195) If $\overrightarrow{AB} = \overrightarrow{CD}$. Find the coordinates of the points A when points B, C, D are $(1, 2), (-2, 5), (4, 11)$ respectively.
196) If B, C and D are respectively $(4, 1), (-2, 3)$ and $(-8, 0)$. Use vector method to find the coordinates of the point A if $ABCD$ is a parallelogram.
197) Define Parallel vectors.
198) Find α, so that $\left|\alpha\underline{i} + (\alpha + 1)\underline{j} + 2\underline{k}\right| = 3$
199) Find a vector whose magnitude is 4 and is parallel to $2\underline{i} - 3\underline{j} + 6\underline{k}$.
200) Find a and b so that the vectors $3\underline{i} - \underline{j} + 4\underline{k}$ and $a\underline{i} + b\underline{j} - 2\underline{k}$ are parallel.
201) Find the direction cosines for the given vector: $\underline{v} = 3\underline{i} - \underline{j} + 2\underline{k}$

202) Find Two vectors of length 2 parallel to the vector $\underline{v} = 2\underline{i} - 4\underline{j} + 4\underline{k}$.

203) Calculate the projection of $\underline{a}$ along $\underline{b}$ if $\underline{a} = \underline{i} - \underline{k}$, $\underline{b} = \underline{j} + \underline{k}$

204) Find a real number α so that the vectors $\underline{u}$ and $\underline{v}$ are perpendicular $\underline{u} = 2\alpha\underline{i} + \underline{j} - \underline{k}$, $\underline{v} = \underline{i} + \alpha\underline{j} + 4\underline{k}$

205) If $\underline{v}$ is a vector for which $\underline{v}.\underline{i} = 0$, $\underline{v}.\underline{j} = 0$, $\underline{v}.\underline{k} = 0$ find $\underline{v}$.

206) Find the angle between the vectors $\underline{u} = 2\underline{i} - \underline{j} + \underline{k}$ and $\underline{v} = \underline{-i} + \underline{j}$

207) If $\underline{u} = 2\underline{i} - \underline{j} + \underline{k}$ and $\underline{v} = 4\underline{i} + 2\underline{j} - \underline{k}$, find $\underline{u} \times \underline{v}$ and $\underline{v} \times \underline{u}$

208) Find the area of triangle, determined by the point $P(0,0,0)$; $Q(2,3,2)$; $R(-1,1,4)$

209) Find the area of $||^m$, whose vertices are: $A(1,2,-1)$; $B(4,2,-3)$; $C(6,-5,2)$; $D(9,-5,0)$

210) Which vectors, if any, are perpendicular or parallel

211) $\underline{u} = \underline{i} + 2\underline{j} - \underline{k}$; $\underline{v} = \underline{-i} + \underline{j} + \underline{k}$; $\underline{w} = -\frac{\pi}{2}\underline{i} - \pi\underline{j} + \frac{\pi}{2}\underline{k}$

212) If $\underline{a} + \underline{b} + \underline{c} = 0$, then prove that $\underline{a} \times \underline{b} = \underline{b} \times \underline{c} = \underline{c} \times \underline{a}$

213) If $\underline{a} \times \underline{b} = 0$ and $\underline{a}.\underline{b} = 0$, what conclusion can be drawn about $\underline{a}$ or $\underline{b}$?

214) What are coplanar vectors?

215) A force $\underline{F} = 7\underline{i} + 4\underline{j} - 3\underline{k}$ is applied at $P(1,-2,3)$. Find its moment about the point $Q(2,1,1)$.

216) Find work done by $\underline{F} = 2\underline{i} + 4\underline{j}$ if its points of application to a body moves if from $A(1,1)$ to $B(4,6)$.

217) Prove that the vectors $\underline{i} - 2\underline{j} + \underline{k}, -2\underline{i} + 3\underline{j} - 4\underline{k}$ and $\underline{i} - 3\underline{j} + 5\underline{k}$ are coplanar.

218) If $\underline{a} = 3\underline{i} - \underline{j} + 5\underline{k}, \underline{b} = 4\underline{i} + 3\underline{j} - 2\underline{k}$ and $\underline{c} = 2\underline{i} + 5\underline{j} + \underline{k}$ fine $\underline{a}.\underline{b} \times c$

219) Find the volume of tetrahedron with the vertices $A(0,1,2)$, $B(3,2,1)$, $C(1,2,1)$ and $D(5,5,6)$.

220) Find the value of $2\underline{i} \times 2\underline{j}.\underline{k}$ and $[k \ \ i \ \ j]$

221) Prove that $\underline{u}.(\underline{v} \times \underline{w}) + \underline{v}.(\underline{w} \times \underline{u}) + \underline{w}.(\underline{u} \times \underline{v}) = 3\underline{u}.(\underline{v} \times \underline{w})$

222) Find the value of , so that $\alpha\underline{i} + \underline{j}, \underline{i} + \underline{j} + 3\underline{k}$ and $2\underline{i} + \underline{j} - 2\underline{k}$ are coplanar.

Long Questions

1) Given $f(x) = x^3 - ax^2 + bx + 1$ If $f(2) = -3$ and $f(-1) = 0$. Find a and b.

2) For the real valued function , f defined below , find $f^{-1}(x)$ and verify

$$f\left(f^{-1}(x)\right) = (f^{-1}(f(x)) = x \text{ if } f(x) = -2x + 8$$

3) Prove that $if\ \theta\ is\ measured\ in\ radian\ , then\ \lim_{\theta \to 0} \frac{Sin\theta}{\theta} = 1$

a. Evaluate $\lim_{\theta \to 0} \frac{tan\theta - sin\theta}{sin^3\theta}$

4) Find the values of m and n , so that given function f is continuous at $x = 3$

5) $f(x) = \begin{cases} mx & if \quad x < 3 \\ n & if \quad x = 3 \\ -2x + 9 & if \quad x > 3 \end{cases}$

6) If $f(x) = \begin{cases} \frac{\sqrt{2x+5} - \sqrt{x+7}}{x-2} & , \ x \neq 2 \\ k & , \ x = 2 \end{cases}$ Find the value of k so that f is continuous at $x =$

7) Find from first Principles , the derivative $w.r.t$ 'x' $(ax + b)^3$

8) Find from first principles the derivative of $\frac{1}{(az-b)^7}$

9) Differentiate $\sqrt{\frac{a-x}{a+x}}\, w.r.t\ 'x'$.

10) Find $\frac{dy}{dx}$ if $y = \frac{(1+\sqrt{x})(x - x^{\frac{3}{2}})}{\sqrt{x}}$

11) Prove that $y\frac{dy}{dx}+x=0\ if\ x=\frac{1-t^2}{1+t^2}\quad ,y=\frac{2t}{1+t^2}$
12) Differentiate $\frac{ax+b}{cx+d}\ w.r.t\ \frac{ax^2+b}{ax^2+d}$
13) Show that $\frac{dy}{dx}=\frac{y}{x}\ if\ \frac{y}{x}=Tan^{-1}\frac{x}{y}$
14) Differentiate $cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)$
15) Differentiate $\sqrt{tanx}$ from first principles.
16) If $x=acos^3\theta, y=bsin^3\theta$, show that $a\frac{dy}{dx}+btan\theta=0$
17) Find $f'(x)$ if $f(x)=\sqrt{ln(e^{2x}+e^{-2x})}$
18) Find $\frac{dy}{dx}$ if $y=ln\left(x+\sqrt{x^2+1}\right)$
19) Find $f'(x)$ if $f(x)=\frac{e^{ax}-e^{-ax}}{e^{ax}+e^{-ax}}$
20) If $y=acos(lnx)+bsin(lnx)$, prove that $x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}=0$
21) If $y=e^xsinx$, show that $\frac{d^2y}{dx^2}-2\frac{dy}{dx}+2y=0$
22) If $y=\left(cos^{-1}x\right)^2$, prove that $(1-x^2)y_2-xy_1-2=0$
23) Show that $2^{x+h}=2x[1+(ln2)h+(ln2)^2\frac{h^2}{2!}+\ (ln2)^3\frac{h^3}{3!}+\cdots$
24) Show that $cos(x+h)=cosx-hsinx+\frac{h^2}{2!}\ cosx+\frac{h^3}{3!}sinx+\cdots$ and evaluate $cos61°$
25) Show that $y=\frac{lnx}{x}$ has maximum value at $x=e$.
26) Show that $y=x^x$ has minimum value at $x=\frac{1}{e}$.
27) Use differentials, find the approximate value of $sin46°$.
28) Use differentials to approximate the values of $\sqrt[4]{17}$.
29) Show that $\int\sqrt{a^2-x^2}dx=\frac{a^2}{2}Sin^{-1}\frac{x}{2}+\frac{x}{2}\sqrt{a^2-x^2}+c$
30) Show that $\int\frac{dx}{\sqrt{x^2-a^2}}=ln\left(x+\sqrt{x^2-a^2}\right)+c$
31) Evaluate $\int sin^4xdx$
32) Find $\int e^{ax}cosbxdx$
a. Evaluate $\int\sqrt{4-5x^2}dx$
33) Show that $\int e^{ax}sinbx=\frac{1}{\sqrt{a^2+b^2}}e^{ax}\ sin\left(bx-Tan^{-1}\frac{b}{a}\right)+c$
a. Evaluate $\int e^{2x}cos3xdx$
34) Evaluate $\int\frac{x-2}{(x+1)(x^2+1)}dx$
35) Evaluate $\int\frac{2x^2}{(x-1)^2(2x+3)}dx$
36) Evaluate $\int_0^{\frac{\pi}{4}}(1+cos^2\theta)tan^2\theta\, d\theta$
37) Evaluate $\int_0^1\frac{3x}{\sqrt{4-3x}}dx$
38) Evaluate $\int_{\frac{\pi}{6}}^{\frac{\pi}{4}}cos^2\theta cot^2\theta d\theta$
39) Find the area between the curve $y=x(x-1)(x+1)$ and the $x-axis$.
40) Find the area between the $x-axis$ and the curve $y=\sqrt{2ax-x^2}$ when $a>0$.
41) Find the area between bounded by $y=x(x^2-4)$ and the $x-axis$

42) Find h such that the quadrilateral with vertices $(-3,0)$, $B(1,-2)$, $C(5,0)$ and $D(1,h)$ is parallelogram. Is it a square?
43) Find the points that divide the line segment joining $A(x_1,y_1)$ and $B(x_2,y_2)$ into four equal parts.
44) The xy −coordiante axes are rotated about the origin through the indicated angle. The new axes are $O'X$ and $O'Y$.Find the XY-cooridiantes of the point P with the given
45) xy-coordinates if $P(15,10)$ and $\theta = arctan\frac{1}{3}$
46) The xy −coordinte axes are rotated about the origin through the indicated angle and the new axes are OX and OY. Find the xy −coordinates of P and with the given XY-coordiantes if $P(-5,3)$ and $\theta = 30°$
a. $3x-4y+3=0$; $3x-4y+7=0$
47) The points $A(-1,2)$, $B(6,3)$ and $C(2,-4)$ are vertices of a triangle. Show that the line joining the midpoint D of AB and the midpoint E of AC is parallel to BC and $DE = \frac{1}{2}BC$.
48) Find the interior angles of the triangle whose vertices are $A(6,1)$, $B(2,7)$, $C(-6,-7)$
49) Find the area of the region bounded by the triangle whose sides are

$$7x-y-10=0 \ ;10x+y-41=0 \ ; \ 3x+2y+3=0$$

50) Find the interior angles of the quadrilateral whose vertices are $A(5,2)$, $B(-2,3)$, $C(-3,-4)$ and $D(4,-5)$
51) Find the lines represented by $x^2+2xysec\alpha+y^2=0$ and also find measure of the angle between them.
52) Find a join equation of the lines through the origin and perpendicular to the lines: $x^2-2xytan\alpha-y^2=0$
53) Find a joint equation of the lines through the origin and perpendicular to the lines $ax^2+2hxy+by^2=0$
54) Graph the following system of inequalities
a. $2x+y\geq 2$; $x+2y\leq 10$; $y\geq 0$
55) Graph the following system of inequalities and find the corner points
a. $x+y\leq 5$; $-2x+y\leq 0$; $y\geq 0$
56) Graph the solution region of the following system of linear inequalities by shading
a. $2x+3y\leq 18$; $2x+y\leq 10$; $-2x+y\leq 10$
57) Graph the feasible region and find the corner points of
1. $2x+y\leq 10$; $x+4y\leq 12$; $x+2y\leq 10$ $x\geq 0$; $y\geq 0$
58) Graph the feasible region and find the corner points of
1. $2x+y\leq 20$; $8x+15y\leq 120$; $x+y\leq 11$ $x\geq 0$; $y\geq 0$
59) Maximize $f(x,y)=x+3y$ subject to constraints
a. $2x+5y\leq 30$; $5x+4y\leq 20$ $x\geq 0$; $y\geq 0$
60) Minimize $z=3x+y$ subject to constraints
1. $3x+5y\geq 15$; $x+6y\geq 9$ $x\geq 0$; $y\geq 0$
61) Maximize $f(x,y)=2x+5y$ subject to constraints
1. $2y-x\leq 8$; $x-y\leq 4$ $x\geq 0$; $y\geq 0$
62) Find an equation of the circle passing through $A(3,-1)$, $B(0,1)$ and having centre at $4x-3y-3=0$
63) Show that the circles $x^2+y^2+2x-8=0$ and $x^2+y^2-6x+6y-46=0$ touch internally.
64) Find the equation of the circle of radius 2 and tangent to the line $x-y-4=0$ at $A(1,-3)$
65) Show that the lines $3x-2y=0$ and $2x+3y-13=0$ are tangents to the circle $x^2+y^2+6x-4y=0$
66) Find the length of the chord cut off from the line $2x+3y=13$ by the circle $x^2+y^2=26$
67) Find the length of the tangent drawn from the point $(-5,4)$ to the circle $5x^2+5y^2-10x+15y-131=0$
68) Find an equation of the chord of contact of the tangents drawn from $(4,5)$ to the circle $2x^2+2y^2-8x+12y+21=0$
69) Prove that length of a diameter of the circle $x^2+y^2=a^2$ is $2a$.

70) Find an equation of the parabola having its focus at the origin and directrix parallel to the (i) $x - axis$ (ii) $y - axis$
71) Prove that the letusrectum of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is $\frac{2b^2}{a}$.
72) Let a be a positive number and $0 < c < a$. Let $F(-c, 0)$ and $F'(c, 0)$ be two given points. Prove that the locus of points $P(x, y)$ such that $|PF| + |PF'| = 2a$, is an ellipse.

a. For any point on the hyperbola the difference of its distances from the points $(2, 2)$ and $(10, 2)$ is 6. Find the equation of hyperbola

b. Let $0 < a < c$ and $F'(-c, 0)$, $F(c, 0)$ be two fixed points . Show that th set of points $P(x, y)$ such that

c. $|PF| - |PF'| = \pm 2a$ is the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{c^2 - a^2} = 1$

d. Show that the product of the distances from the foci to any tangent to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is constant.

73) Find equations of tangent and normal to each of the following at the indicated point: $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ at $(a\cos\theta, b\sin\theta)$
74) Find the points of intersection of the given conics $4x^2 + y^2 = 16$ and $x^2 + y^2 + y + 8 = 0$
75) Find an equation referred to the new axes obtained rotation of axes about the origin through the given angle:
76) $7x^2 - 8xy + y^2 - 9 = 0$, $\theta = \arctan 2$
77) $9x^2 + 12xy + 4y^2 - x - y = 0$, $\theta = \arctan\frac{2}{3}$
78) Find measure of the angle through which the axes be rotated so that the product term XY is removed from the transformed equation. Also find the transformed equation: $xy + 4x - 3y - 10 = 0$
79) Find an equation of the tangent to each of the given conic at the indicated point: $3x^2 - 7y^2 + 2x - y - 48 = 0$ at $(4, 1)$
80) Find an equation of the tangent to the conic $x^2 - xy + y^2 - 2 = 0$ at the point whose ordinate is $\sqrt{2}$.
81) Prove that the line segment joining the mid points of two sides of a triangle is parallel to the third side and half as long.
82) The position vectors of the points A, B, C and D are $2\underline{i} - \underline{j} + \underline{k}$, $3\underline{i} + \underline{j}$, $2\underline{i} + 4\underline{j} - 2\underline{k}$ and $-\underline{i} - 2\underline{j} + \underline{k}$ respectively. Show that $\overrightarrow{AB}$ is parallel to $\overrightarrow{CD}$.
83) Prove that $\cos(\alpha + \beta) = \beta\cos\alpha\sin\beta - \sin\alpha\cos\beta$
84) Prove that the altitudes of a triangle are concurrent.
85) Prove that : $\sin(\alpha - \beta) = \sin\alpha\cos\beta - \cos\alpha\sin\beta$
86) Prove that : $\underline{a} \times (\underline{b} + \underline{c}) + \underline{b} \times (\underline{c} + \underline{a}) + \underline{c} \times (\underline{a} + \underline{b}) = 0$
87) Prove that the points whose position vectors are $\left(-6\underline{i} + 3\underline{j} + 2\underline{k}\right)$, $B\left(3\underline{i} - 2\underline{j} + 4\underline{k}\right)$, $C\left(5\underline{i} + 7\underline{j} + 3\underline{k}\right)$ and $D\left(-13\underline{i} + 17\underline{j} - \underline{k}\right)$ are coplanar. A force of magnitude 6 units acting parallel to $2\underline{i} - 2\underline{j} + \underline{k}$ displces, the point of application from $(1, 2, 3)$ to $(5, 3, 7)$. Find the work done.

Multiple Choice Questions (100 % Challenge)

1. **If $f(x) = x^2 - 2x + 1$, then $f(0) =$**
   (a) -1 (b) 0 (c) ✔ 1 (d) 2
2. **When we say that f is function from set X to set Y, then X is called**
   (a) ✔Domain of f (b) Range of f (c) Codomain of f (d) None of these
3. **The term "Function" was recognized by______ to describe the dependence of one quantity to another.**
   (a) ✔Lebnitz (b) Euler (c) Newton (d) Lagrange
4. **If $f(x) = x^2$ then the range of f is**
   (a) ✔ $[0,\infty)$ (b) $(-\infty, 0]$ (c) $(0, \infty)$ (d) None of these
5. **$Cosh^2x - Sinh^2x =$**
   (a) -1 (b) 0 (c) ✔1 (d) None of these
6. **$cosechx$ is equal to**
   (a) $\frac{2}{e^x+e^{-x}}$ (b) $\frac{1}{e^x-e^{-x}}$ (c) ✔ $\frac{2}{e^x-e^{-x}}$ (d) $\frac{2}{e^{-x}+e^x}$
7. **The domain and range of identity function , $I: X \to X$ is**
   (a) ✔X (b) +iv real numbers (c) –iv real numbers (d) integers
8. **The linear function $f(x) = ax + b$ is constant function if**
   $a \neq 0, b = 1$ (b) $a = 1, b = 0$ (c) $a = 1, b = 1$ (d) ✔ $a = 0$
9. **If $f(x) = 2x + 3$, $g(x) = x^2 - 1$, then $(gof)(x) =$**
   (a) $2x^2 - 1$ (b) ✔ $4x^2 + 4x$ (c) $4x + 3$ (d) $x^4 - 2x^2$
10. **If $f(x) = 2x + 3$, $g(x) = x^2 - 1$, then $(gog)(x) =$**
    (b) $2x^2 - 1$ (b) $4x^2 + 4x$ (c) $4x + 3$ (d) ✔ $x^4 - 2x^2$
11. **The inverse of a function exists only if it is**
    (a) an into function (b) an onto function (c) ✔ (1-1) and into function (d) None of these
12. **If $f(x) = 2 + \sqrt{x-1}$, then domain of $f^{-1} =$**
    (a)]2,∞[(b) ✔ [2,∞[(c) [1,∞[(d)]1,∞[
13. **$\lim_{x\to\infty} e^x =$**
    (a) 1 (b) ∞ (c) ✔ 0 (d) -1
14. **$\lim_{x\to 0} \frac{\sin(x-3)}{x-3} =$**
    (a) ✔1 (b) ∞ (c) $\frac{sin3}{3}$ (d) -3
15. **$\lim_{x\to 0} \frac{\sin(x-a)}{x-a} =$**
    (a) ✔1 (b) ∞ (c) $\frac{sina}{a}$ (d) -3
16. **$f(x) = x^3 + x$ is :**
    (a) Even (b) ✔ Odd (c) Neither even nor odd (d) None
17. **If $f: X \to Y$ is a function , then elements of x are called**
    (a) Images (b) ✔ Pre-Images (c) Constants (d) Ranges
18. **$\lim_{x\to 0} \left(\frac{x}{1+x}\right) =$**
    (a) e (b) ✔ e^{-1} (c) e^2 (d) $\sqrt{e}$
19. **$\lim_{x\to 0} \frac{a^x-1}{x}$ is equal to**
    (a) log_{e^x} (b)log_{a^x} (c) a (d) ✔ log_{e^a}
20. **$\lim_{x\to 0} \frac{Sinx^\circ}{x} =$**

(a) ✔ $\frac{\pi}{180°}$ (b) $\frac{180°}{\pi}$ (c) $180\,\pi$ (d) 1

21. **A function is said to be continuous at $x = c$ if**
    (a) $\lim_{x\to c} f(x)$ exists (b) $f(c)$is defined (c) $\lim_{x\to c} f(x) = f(c)$ (d) ✔ All of these
22. **The function $f(x) = \frac{x^2-1}{x-1}$ is discontinuous at**
    (a) ✔1 (b) 2 (c) 3 (d) 4
1. **L.H.L of $f(x) = |x-5|$ at $x = 5$ is**
23. 5 (b) ✓0 (c) 2 (d) 4

24. **The change in variable x is called increment of x.It is denoted by δx which is**
    (a) +iv only (b) –iv only (c) ✔ +iv or –iv (d) none of these
25. **The notation $\frac{dy}{dx}$ or $\frac{df}{dx}$ is used by**
    (a) ✔Leibnitz (b) Newton (c)Lagrange (d) Cauchy
26. **The notation $\dot{f}(x)$ is used by**
    (a) Leibnitz (b) ✔ Newton (c) Lagrange (d) Cauchy
27. **The notation $f'(x)$ or y' is used by**
    (a) Leibnitz (b) Newton (c) ✔ Lagrange (d) Cauchy
28. **The notation $Df(x)$ or Dy is used by**
    (a) Leibnitz (b) Newton (c) Lagrange (d) ✔ Cauchy
29. $\lim_{x\to a} \frac{f(x)-f(a)}{x-a} =$
    (a) ✔$f'(x)$ (b) $f'(a)$ (c) $f(0$ (d) $f(x-a)$
30. $\frac{d}{dx}(x^n) = nx^{n-1}$ **is called**
    (a) ✔ Power rule (b) Product rule (c) Quotient rule (d) Constant

31. **The derivative of a constant function is**
    (a) one (b) ✔ zero (c) undefined (d) None of these
32. **The process of finding derivatives is called**
    (a) ✔Differentiation (b) differential (c) Increment (d) Integration
33. **If** $f(x) = \frac{1}{x}$ **,** $then\ f''(a) =$
    (a) $-\frac{2}{(a)^3}$ (b) $-\frac{1}{a^2}$ (c) $\frac{1}{a^2}$ (d) ✔ $\frac{2}{a^3}$
34. $(fog)'(x) =$
    (a) $f'g'$ (b) $f'g(x)$ (c) ✔ $f'(g(x))g'(x)$ (d) cannot be calculated
35. $\frac{d}{dx}(g(x))^n =$
    (a) $n[g(x)]^{n-1}$ (b) $n[(g(x)]^{n-1}g(x)$ (c) ✔ $n[(g(x)]^{n-1}g'(x)$ (d) $[g(x)]^{n-1}g'(x)$
36. $\frac{d}{dx}\left(3x^{\frac{4}{3}}\right) =$
    (a) $4x^{\frac{2}{3}}$ (b) ✔$4x^{\frac{1}{3}}$ (c) $2x^{\frac{1}{3}}$ (d) $3x^{\frac{1}{3}}$
37. **If $x = at^2$ and $y = 2at$ then $\frac{dy}{dx} =$**
    (a) $\frac{2}{ya}$ (b) $\frac{y}{2a}$ (c) ✔ $\frac{2a}{y}$ (d) $\frac{2}{y}$
38. $\frac{d}{dx}(tan^{-1}x - cot^{-1}x) =$
    (a) $\frac{2}{\sqrt{1+x^2}}$ (b) ✔ $\frac{2}{1+x^2}$ (c) 0 (d) $\frac{-2}{1+x^2}$
39. **If $Sin\,\sqrt{x}$, then $\frac{dy}{dx}$ is equal to**

(a) ✔$\frac{\cos\sqrt{x}}{2\sqrt{x}}$ (b) $\frac{\cos\sqrt{x}}{\sqrt{x}}$ (c) $\cos\sqrt{x}$ (d) $\frac{\cos x}{\sqrt{x}}$

40. $\frac{d}{dx}\sec^{-1}x =$

(a) ✔$\frac{1}{|x|\sqrt{x^2-1}}$ (b) $\frac{-1}{|x|\sqrt{x^2-1}}$ (c) $\frac{1}{|x|\sqrt{1+x^2}}$ (d) $\frac{-1}{|x|\sqrt{1+x^2}}$

41. $\frac{d}{dx}\mathrm{cosec}^{-1}x =$

(a) $\frac{1}{|x|\sqrt{x^2-1}}$ (b) ✔ $\frac{-1}{|x|\sqrt{x^2-1}}$ (c) $\frac{1}{|x|\sqrt{1+x^2}}$ (d) $\frac{-1}{|x|\sqrt{1+x^2}}$

42. Differentiating $\sin^3 x$ w.r.t $\cos^2 x$ is

(a) ✔$-\frac{3}{2}\sin x$ (b) $\frac{3}{2}\sin x$ (c) $\frac{2}{3}\cos x$ (d) $-\frac{2}{3}\cos x$

43. If $\frac{y}{x} = Tan^{-1}\frac{x}{y}$ then $\frac{dy}{dx} =$

(a) $\frac{x}{y}$ (b) $-\frac{x}{y}$ (c) ✔ $\frac{y}{x}$ (d) $-\frac{y}{x}$

44. If $\tan y(1+\tan x) = 1-\tan x$, show that $\frac{dy}{dx} =$

(a) 0 (b) 1 (c) ✔ -1 (d) 2

45. $\frac{d}{dx}(Sin^{-1}x) = \frac{1}{\sqrt{1-x^2}}$ is valid for

(a) $0 < x < 1$ (b) $-1 < x < 0$ (c) ✔ $-1 < x < 1$ (d) None of these

46. If $y = x\sin^{-1}\left(\frac{x}{a}\right) + \sqrt{a^2-x^2}$ then $\frac{dy}{dx} =$

(a) $Cos^{-1}\frac{x}{a}$ (b) $Sec^{-1}\frac{x}{a}$ (c) ✔$Sin^{-1}\frac{x}{a}$ (d) $Tan^{-1}\frac{x}{a}$

47. If $y = e^{-ax}$, then $y\frac{dy}{dx} =$

(a) ✔$-ae^{-2ax}$ (b) $-a^2e^{ax}$ (c) a^2e^{-2ax} (d) $-a^2e^{-2ax}$

48. $\frac{d}{dx}(10^{\sin x}) =$

(a) $10^{\cos x}$ (b) ✔ $10^{\sin x}.\cos x.\ln 10$ (c) $10^{\sin x}.\ln 10$ (d) $10^{\cos x}.\ln 10$

49. If $y = e^{ax}$ then $\frac{dy}{dx} =$

(a) $\frac{1}{e^x}$ (b) ✔ ae^{ax} (c) e^{ax} (d) $\frac{1}{a}e^{ax}$

50. $\frac{d}{dx}(a^x) =$

(a) a^x (b) $e^x\ln a$ (c) ✔ $a^x.\ln a$ (d) $x^a.\ln a$

51. The function $f(x) = a^x, a > 0, a \neq 0$, and x is any real number is called

(a) ✔Exponential function (b) logarithmic function (c) algebraic function (d) composite function

1. If $a > 0, a \neq 1$, and $x = a^y$ then the function defined by $y = \log a^x\ (x > 0)$ is called a logarithmic function with base

(a) 10 (b) e (c) ✔ a (d) x

52. $\log_{a^a} =$

(a) ✔1 (b) e (c) a^2 (d) not defined

53. $\frac{d}{dx}\log_{a^x} =$

(a) $\frac{1}{x}\log a$ (b) ✔ $\frac{1}{x\ln a}$ (c) $\frac{\ln x}{x\ln x}$ (d) $\frac{\ln a}{x\ln x}$

54. $\frac{d}{dx}\ln[f(x)] =$

(a) $f'(x)$ (b) $\ln f'(x)$ (c) ✔ $\frac{f'(x)}{f(x)}$ (d) $f(x).f'(x)$

55. If $y = \log 10^{(ax^2+bx+c)}$ then $\frac{dy}{dx} =$

(a) ✔$\frac{1}{(ax^2+bx+c)\ln 10}$ (b) $\frac{2ax+b}{(ax^2+bx+c)}$ (c) $10^{ax^2+bx+c}\ \ln 10$ (d) $\frac{2ax+b}{(ax^2+bx+c)\ln a}$

56. $\ln a^e =$

(a) lna (b) ✔ $\frac{1}{lna}$ (c) $\frac{1}{\ln a^e}$ (d) $\ln e^e$

57. If $y = e^{2x}$, then $y_4 =$

(a) ✔ $16e^{2x}$ (b) $8e^{2x}$ (c) $4e^{2x}$ (d) $2e^{2x}$

58. If $f(x) = e^{2x}$, then $f'''(x) =$

(a) $6e^{2x}$ (b) $\frac{1}{6}e^{2x}$ (c) ✔ $8e^{2x}$ (d) $\frac{1}{8}e^{2x}$

59. If $f(x) = x^3 + 2x + 9$ then $f''(x) =$

(a) $3x^2 + 2$ (b) $3x^2$ (c) ✔ $6x$ (d) $2x$

60. If $y = x^7 + x^6 + x^5$ then $D^8(y) =$

(a) 7! (b) $7!\,x$ (c) $7! + 6!$ (d) ✔ 0

61. $1 - x + x^2 - x^3 + x^4 + \cdots . + (-1)^n x^n + \cdots$ is the expansion of

(a) $\frac{1}{1-x}$ (b) ✔ $\frac{1}{1+x}$ (c) $\frac{1}{\sqrt{1-x}}$ (d) $\frac{1}{\sqrt{1+x}}$

62. $f(x) = f(0) + xf'(x) + \frac{x^2}{2!}f''(x) + \frac{x^3}{3!}f'''(x) + \cdots \ldots . + \frac{x^n}{n!}f^n(x) \ldots$ is called____ series.

(a) ✔ Machlaurin's (b) Taylor's (c) Convergent (d) Divergent

63. $1 - x + \frac{x^2}{2!} - \frac{x^3}{3!} + \frac{x^4}{4!} + \ldots\ldots\ldots\ldots$ is an expression of

(a) e^x (b) $Sinx$ (c) ✔ $Cosx$ (d) e^{-x}

64. $a_0 + a_1x + a_2x^2 + \cdots + a_nx^n + \cdots$ is

(a) Maclaurin's series (b) Taylor Series (c) ✔ Power Series (d) Bionomial Serie

65. A function $f(x)$ is such that, at a point $x = c$, $f'(x) > 0$ at $x = c$, then f is said to be

(a) ✔ Increasing (b) decreasing (c) constant (d) 1-1 function

66. A function $f(x)$ is such that, at a point $x = c$, $f'(x) < 0$ at $x = c$, then f is said to be

(a) Increasing (b) ✔ decreasing (c) constant (d) 1-1 function

67. A function $f(x)$ is such that, at a point $x = c$, $f'(x) = 0$ at $x = c$, then f is said to be

(a) Increasing (b) decreasing (c) ✔ constant (d) 1-1 function

68. A stationary point is called _____ if it is either a maximum point or a minimum point

(a) Stationary point (b) ✔ turning point (c) critical point (d) point of inflexion

69. If $f'(c)$ does not change before and after $x = c$, then this point is called______

(a) Stationary point (b) turning point (c) critical poin (d) ✔ point of inflexion

70. Let f be a differentiable function such that $f'(c) = 0$ then if $f'(x)$ changes sign from -iv to +iv i.e., before and after $x = c$, then it occurs relative _____ at $x = c$

(a) Maximum (b) ✔ minimum (c) point of inflexion (d) none

71. Let f be a differentiable function such that $f'(c) = 0$ then if $f'(x)$ does not change sign i.e., before and after $x = c$, then it occurs _____ at $x = c$

(b) Maximum (b) minimum (c) ✔ point of inflexion (d) none

72. Let f be differentiable function in neighborhood of c and $f'(c) = 0$ then $f(x)$ has relative maxima at c if

(a) $f''(c) > 0$ (b) ✔ $f''(c) < 0$ (c) $f''(c) = 0$ (d) $f''(c) \neq 0$

73. If $\int f(x)dx = \varphi(x) + c$,then $f(x)$ is called

(a) Integral (b) differential (c) derivative (d) ✔ integrand

74. Inverse of $\int \ldots . dx$ is:

(a) ✔ $\frac{d}{dx}$ (b) $\frac{dy}{dx}$ (c) $\frac{d}{dy}$ (d) $\frac{dx}{dy}$

75. Differentials are used to find:

(a) ✔ Approximate value (b) exact value (c) Both (a) and (b) (d) None of these

76. $xdy + ydx =$

(a) $d(x+y)$ (b) ✔ $d\left(\frac{x}{y}\right)$ (c) $d(x-y)$ (d) $d(xy)$

77. If $dy = cosxdx$ then $\frac{dx}{dy} =$

(a) $sinx$ (b) $cosx$ (c) $cscx$ (d) ✔ $secx$

78. If $\int f(x)dx = \varphi(x) + c$,then $f(x)$ is called

(b) Integral (b) differential (c) derivative (d) ✔ integrand

79. If $y = f(x)$, then differential of y is

(a) $dy = f'(x)$ (b) ✔ $dy = f'(x)dx$ (c) $dy = f(x)dx$ (d) $\frac{dy}{dx}$

80. The inverse process of derivative is called:

(a) Anti-derivative (b) ✔ Integration (c) Both (a) and (b) (d) None of these

81. If $n \neq 1$, then $\int (ax+b)^n dx =$

(a) $\frac{n(ax+b)^{n-1}}{a} + c$ (b) $\frac{n(ax+b)^{n+1}}{n} + c$ (c) $\frac{(ax+b)^{n-1}}{n+1} + c$ (d) ✔ $\frac{(ax+b)^{n+1}}{a(n+1)} + c$

82. $\int \sin(ax+b)\, dx=$

(a) ✔ $\frac{-1}{a}\cos(ax+b) + c$ (b) $\frac{1}{a}\cos(ax+b) + c$ (c) $a\cos(ax+b) + c$ (d) $-a\cos(ax+b) + c$

83. $\int e^{-\lambda x} dx =$

(a) $\lambda e^{-\lambda x} + c$ (b) $-\lambda e^{-\lambda x} + c$ (c) $\frac{e^{-\lambda x}}{\lambda} + c$ (d) ✔ $\frac{e^{-\lambda x}}{-\lambda} + c$

84. $\int a^{\lambda x} dx =$

(a) $\frac{a^{\lambda x}}{\lambda}$ (b) $\frac{a^{\lambda x}}{lna}$ (c) ✔ $\frac{a^{\lambda x}}{alna}$ (d) $a^{\lambda x}\lambda . lna$

85. $\int [f(x)]^n f'(x) dx =$

(a) $\frac{f^n(x)}{n} + c$ (b) $f(x) + c$ (c) ✔ $\frac{f^{n+1}(x)}{n+1} + c$ (d) $nf^{n+1}(x) + c$

86. $\int \frac{f'(x)}{f(x)} dx =$

(a) $f(x) + c$ (b) $f'(x) + c$ (c) ✔ $\ln|x| + c$ (nd) $\ln|f'(x)| + c$

87. $\int \frac{dx}{\sqrt{x+a}+\sqrt{x}}$ can be evaluated if

(a) ✔ $x > 0, a > 0$ (b) $x < 0, a > 0$ (c) $x < 0, a < 0$ (d) $x > 0, a < 0$

88. $\int \frac{x}{\sqrt{x^2+3}} dx =$

(a) ✔ $\sqrt{x^2+3} + c$ (b) $-\sqrt{x^2+3} + c$ (c) $\frac{\sqrt{x^2+3}}{2} + c$ (d) $-\frac{1}{2}\sqrt{x^2+3} + c$

89. $\int \frac{dx}{x\sqrt{x^2-1}} =$

(a) ✔ $Sec^{-1}x + c$ (b) $Tan^{-1}x + c$ (c) $Cot^{-1}x + c$ (d) $Sin^{-1}x + c$

90. $\int \frac{dx}{xlnx} =$

(a) ✔ $\ln lnx + c$ (b) $x + c$ (c) $lnf'(x) + c$ (d) $f'(x)lnf(x)$

91. In $\int (x^2 - a^2)^{\frac{1}{2}} dx$, the substitution is

(a) $x = atan\theta$ (b) ✔ $x = asec\theta$ (c) $x = asin\theta$ (d) $x = 2asin\theta$

92. The suitable substitution for $\int \sqrt{2ax - x^2} dx$ is:

(a) $x - a = acos\theta$ (b) ✔ $x - a = asin\theta$ (c) $x + a = acos\theta$ (d) $x + a = asin\theta$

93. $\int \frac{x+2}{x+1} dx =$

(a) $\ln(x+1) + c$ (b) $\ln(x+1) - x + c$ (c) ✔ $x + \ln(x+1) + c$ (d) None

94. The suitable substitution for $\int \sqrt{a^2 + x^2} dx$ is:

(b) ✔ $x = a\tan\theta$ (b) $x = a\sin\theta$ (c) $x = a\cos\theta$ (d) None of these

95. $\int udv$ **equals:**

(a) $udu - \int vu$ (b) $uv + \int vdu$ (c) ✔ $uv - \int vdu$ (d) $udu + \int vdu$

96. $\int x\cos x dx =$

(a) $\sin x + \cos x + c$ (b) $\cos x - \sin x + c$ (c) ✔ $x\sin x + \cos x + c$ (d) None

97. $\int \frac{e^{Tan^{-1}x}}{1+x^2} dx =$

(a) $e^{Tanx} + c$ (b) $\frac{1}{2} e^{Tan^{-1}x} + c$ (c) $x\, e^{Tan^{-1}x} + c$ (d) ✔ $e^{Tan^{-1}x} + c$

98. $\int e^x \left[\frac{1}{x} + \ln x\right] =$

(a) $e^x \frac{1}{x} + c$ (b) $-e^x \frac{1}{x} + c$ (c) ✔ $e^x \ln x + c$ (d) $-e^x \ln x + c$

99. $\int e^x \left[\frac{1}{x} - \frac{1}{x^2}\right] =$

(a) ✔ $e^x \frac{1}{x} + c$ (b) $-e^x \frac{1}{x} + c$ (c) $e^x \ln x + c$ (d) $-e^x \frac{1}{x^2} + c$

100. $\int \frac{2a}{x^2-a^2} dx =$

(a) $\frac{x-a}{x+a} + c$ (b) ✔ $\ln\frac{x-a}{x+a} + c$ (c) $\ln\frac{x+a}{x-a} + c$ (d) $\ln|x-a| + c$

101. $\int_{\pi}^{-\pi} \sin x dx =$

(a) ✔ 2 (b) -2 (c) 0 (d) -1

102. $\int_{-1}^{2} |x| dx =$

(a) $\frac{1}{2}$ (b) $-\frac{1}{2}$ (c) $\frac{5}{2}$ (d) ✔ $\frac{3}{2}$

103. $\int_0^1 (4x + k) dx = 2$ ***then*** $k =$

(a) 8 (b) -4 (c) ✔ 0 (d) -2

104. $\int_0^3 \frac{dx}{x^2+9} =$

(a) $\frac{\pi}{4}$ (b) ✔ $\frac{\pi}{12}$ (c) $\frac{\pi}{2}$ (d) None of these

105. $\int_0^{-\pi} \sin x dx$ **equals to:**

(a) -2 (b) 0 (c) ✔ 2 (d) 1

106. $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \cos t dt =$

(a) ✔ $\frac{\sqrt{3}}{2} - \frac{1}{2}$ (b) $\frac{\sqrt{3}}{2} + \frac{1}{2}$ (c) $\frac{1}{2} - \frac{\sqrt{3}}{2}$ (d) None

107. $\int_a^a f(x) =$

(a) ✔ 0 (b) $\int_b^a f(x)dx$ (c) $\int_b^a f(x)dx$ (d) $\int_a^a f(x)dx$

108. $\int_0^2 2x dx$ **is equal to**

(a) 9 (b) 7 (c) ✔ 4 (d) 0

109. To determine the area under the curve by the use of integration , the idea was given by

(a) Newton (b) ✔ Archimedes (c) Leibnitz (d) Taylor

110. The order of the differential equation : $x\frac{d^2y}{dx^2} + \frac{dy}{dx} - 2 = 0$

(a) 0 (b) 1 (c) ✔ 2 (d) more than 2

1. The equation $y = x^2 - 2x + c$ **represents (** c **being a parameter)**

111. One parabola (b) ✓ family of parabolas (c) family of line (d) two parabolas

112. Solution of the differential equation : $\frac{dy}{dx} = \frac{1}{\sqrt{1-x^2}}$

(a) ✔ $y = \sin^{-1} x + c$ (b) $y = \cos^{-1} x + c$ (c) $y = \tan^{-1} x + c$ (d) None

113. The general solution of differential equation $\frac{dy}{dx} = -\frac{y}{x}$ is
(a) $\frac{x}{y} = c$ (b) $\frac{y}{x} = c$ (c) ✔ $xy = c$ (d) $x^2y^2 = c$

114. Solution of differential equation $\frac{dv}{dt} = 2t - 7$ is :
(a) $v = t^2 - 7t^3 + c$ (b) $v = t^2 + 7t + c$ (c) $v = t - \frac{7t^2}{2} + c$ (d) ✔ $v = t^2 - 7t + c$

115. The solution of differential equation $\frac{dy}{dx} = sec^2x$ is
(a) $y = cosx + c$ (b) ✔ $y = tanx + c$ (c) $y = sinx + c$ (d) $y = cotx + c$

116. $If\ x < 0, y < 0$ then the point $P(x, y)$ lies in the quadrant
(a) I (b) II (c) ✔ III (d) IV

117. The point P in the plane that corresponds to the ordered pair (x, y) is called:
(a) ✔ $graph\ of\ (x, y)$ (b) mid-point of x, y (c) $abscissa\ of\ x, y$ (d) ordinate of x, y

118. The straight line which passes through one vertex and perpendicular to opposite side is called:
(a) Median (b) ✔ altitude (c) perpendicular bisector (d) normal

119. The point where the medians of a triangle intersect is called_______ of the triangle.
(a) ✔ Centroid (b) centre (c) orthocenter (d) circumference

120. The point where the altitudes of a triangle intersect is called_______ of the triangle.
(a) Centroid (b) centre (c) ✔ orthocenter (d) circumference

121. The centroid of a triangle divides each median in the ration of
(a) ✔ 2:1 (b) 1:2 (c) 1:1 (d) None of these

122. The point where the angle bisectors of a triangle intersect is called_______ of the triangle.
(a) Centroid (b) ✔ in centre (c) orthocenter (d) circumference

123. The two intercepts form of the equation of the straight line is
(a) $y = mx + c$ (b) $y - y_1 = m(x - x_1)$ (c) ✔ $\frac{x}{a} + \frac{y}{b} = 1$ (d) $xcos\alpha + ycos\alpha = p$

124. The Normal form of the equation of the straight line is
(a) $y = mx + c$ (b) $y - y_1 = m(x - x_1)$ (c) $\frac{x}{a} + \frac{y}{b} = 1$ (d) ✔ $xcos\alpha + ycos\alpha = p$

125. In the normal form $xcos\alpha + ycos\alpha = p$ the value of p is
(a) ✔ Positive (b) Negative (c) positive or negative (d) Zero

126. If α is the inclination of the line l then $\frac{x - x_1}{cos\alpha} = \frac{y - y_1}{sin\alpha} = r(say)$
(a) Point-slope form (b) normal form (c) ✔ symmetric form (d) none of these

127. The slope of the line $ax + by + c = 0$ is
(a) $\frac{a}{b}$ (b) ✔ $-\frac{a}{b}$ (c) $\frac{b}{a}$ (d) $-\frac{b}{a}$

128. The slope of the line perpendicular to $ax + by + c = 0$
(a) $\frac{a}{b}$ (b) $-\frac{a}{b}$ (c) ✔ $\frac{b}{a}$ (d) $-\frac{b}{a}$

129. The general equation of the straight line in two variables x and y is
(a) ✔ $ax + by + c = 0$ (b) $ax^2 + by + c = 0$ (c) $ax + by^2 + c = 0$ (d) $ax^2 + by^2 + c = 0$

130. The $x - intercept$ $4x + 6y = 12$ is
(a) 4 (b) 6 (c) ✔ 3 (d) 2

131. The lines $2x + y + 2 = 0$ and $6x + 3y - 8 = 0$ are
(a) ✔ Parallel (b) perpendicular (c) neither (d) non coplanar

132. If φ be an angle between two lines l_1 and l_2 when slopes m_1 and m_2, then angle from l_1 to l_2
(a) $tan\varphi = \frac{m_1 - m_2}{1 + m_1 m_2}$ (b) ✔ $tan\varphi = \frac{m_2 - m_1}{1 + m_2 m_1}$ (c) $tan\varphi = \frac{m_1 + m_2}{1 + m_1 m_2}$ (d) $tan\varphi = \frac{m_2 + m_1}{1 + m_1 m_2}$

133. If φ be an acute angle between two lines l_1 and l_2 when slopes m_1 and m_2, then acute angle from l_1 to l_2
(a) $|tan\varphi = \frac{m_1 - m_2}{1 + m_1 m_2}|$ (b) ✔ $|tan\varphi = \frac{m_2 - m_1}{1 + m_2 m_1}|$ (c) $|tan\varphi = \frac{m_1 + m_2}{1 + m_1 m_2}|$ (d) $|tan\varphi = \frac{m_2 + m_1}{1 + m_1 m_2}|$

134. Two lines l_1 and l_2 with slopes m_1 and m_2 are parallel if

(a) ✔ $m_1 - m_2 = 0$ (b) $m_1 + m_2 = 0$ (c) $m_1 m_2 = 0$ (d) $m_1 m_2 = -1$

135. Two lines l_1 and l_2 with slopes m_1 and m_2 are perpendicular if

(b) $m_1 - m_2 = 0$ (b) $m_1 + m_2 = 0$ (c) $m_1 m_2 = 0$ (d) ✔ $m_1 m_2 = -1$

136. The lines represented by $ax^2 + 2hxy + by^2 = 0$ are orthogonal if

(a) $a - b = 0$ (b) ✔ $a + b = 0$ (c) $a + b > 0$ (d) $a - b < 0$

137. The lines lying in the same plane are called

(a) Collinear (b) ✔ coplanar (c) non-collinear (d) non-coplanar

138. The distance of the point $(3, 7)$ from the $x - axis$ is

(a) ✔7 (b) -7 (c) 3 (d) -3

139. Two lines $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ are parallel if

(a) ✔ $\frac{a_1}{a_2} = \frac{b_1}{b_2}$ (b) $\frac{a_1}{b_1} = -\frac{a_2}{b_2}$ (c) $\frac{a_1}{c_1} = \frac{a_2}{c_2}$ (d) $\frac{b_1}{c_1} = \frac{b_2}{c_2}$

140. The equation $y^2 - 16 = 0$ represents two lines.

(a) ✔Parallel to $x - axis$ (b) Parallel $y - axis$ (c) not || to $x - axis$ (d) not || to $y - axis$

141. The perpendicular distance of the line $3x + 4y + 10 = 0$ from the origin is

(a) 0 (b) 1 (c) ✔2 (d) 3

142. The lines represented by $ax^2 + 2hxy + by^2 = 0$ are orthogonal if

(b) $a - b = 0$ (b) ✔ $a + b = 0$ (c) $a + b > 0$ (d) $a - b < 0$

143. Every homogenous equation of second degree $ax^2 + bxy + by^2 = 0$ represents two straight lines

(a) ✔Through the origin (b) not through the origin (c) two || line (d) two ⊥ar lines

144. The equation $10x^2 - 23xy - 5y^2 = 0$ is homogeneous of degree

(a) 1 (b) ✔ 2 (c) 3 (d) more than 2

145. The equation $y^2 - 16 = 0$ represents two lines.

(a) ✔Parallel to $x - axis$ (b) Parallel $y - axis$ (c) not || to $x - axis$ (d) not || to $y - axis$

146. (0,0) is satisfied by

(a) $x - y < 10$ (b) $2x + 5y > 10$ (c) ✔ $x - y \geq 13$ (d) None

147. The point where two boundary lines of a shaded region intersect is called ____ point.

(a) Boundary (b) ✔ corner (c) stationary (d) feasible

148. If $x > b$ then

(a) $-x > -b$ (b) $-x < b$ (c) $x < b$ (d) ✔ $-x < -b$

149. The symbols used for inequality are

(a) 1 (b) 2 (c) 3 (d) ✔4

150. An inequality with one or two variables has ______ solutions.

(a) One (b) two (c) three (d) ✔infinitely many

151. $ax + by < c$ is not a linear inequality if

(a) ✔ $a = 0, b = 0$ (b) $a \neq 0, b \neq 0$ (c) $a = 0, b \neq 0$ (d) $a \neq 0, b = 0, c = 0$

152. The graph of corresponding linear equation of the linear inequality is a line called______

(a) ✔Boundary line (b) horizontal line (c) vertical line (d) inclined line

1. The graph of a linear equation of the form $ax + by = c$ is a line which divides the whole plane into _____ disjoints parts.

(a) ✔Two (b) four (c) more than four (d) infinitely many

153. The graph of the inequality $x \leq b$ is

(a) Upper half plane (b) lower half plane (c) ✔ left half plane (d) right half plane

154. The graph of the inequality $y \leq b$ is

(b) Upper half plane (b) ✔ lower half plane (c) left half plane (d) right half plane

155. The feasible solution which maximizes or minimizes the objective function is called

(a) Exact solution (b) ✔ optimal solution (c) final solution (d) objective function

156. Solution space consisting of all feasible solutions of system of linear in inequalities is called

(a) Feasible solution (b) Optimal solution (c) ✔ Feasible region (d) General solution

157. Corner point is also called

(a) Origin (b) Focus (c) ✔ Vertex (d) Test point

158. For feasible region:

(a) ✔$x \geq 0, y \geq 0$ (b) $x \geq 0, y \leq 0$ (c) $x \leq 0, y \geq 0$ (d) $x \leq 0, y \leq 0$

159. $x = 0$ is in the solution of the inequality

(a) $x < 0$ (b) $x + 4 < 0$ (c) ✔$2x + 3 > 0$ (d)$2x + 3 < 0$

160. Linear inequality $2x - 7y > 3$ is satisfied by the point

(a) (5,1) (b) (-5,-1) (c) (0,0) (d) ✔ (1,-1)

161. The non-negative constraints are also called

(a) ✔Decision variable (b) Convex variable (c) Decision constraints (d) concave variable

1. If the line segment obtained by joining any two points of a region lies entirely within the region , then the region is called

(a) Feasible region (b) ✔ Convex region (c) Solution region (d) Concave region

162. A function which is to be maximized or minimized is called:

(a) Linear function (b) ✔ Objective function (c) Feasible function (d) None of these

163. For optimal solution we evaluate the objective function at

(a) Origen (b) Vertex (c) ✔ Corner Points (d) Convex points

164. We find corner points at

(a) Origen (b) Vertex (c) ✔ Feasible region (d) Convex region

165. The set of points which are equal distance from a fixed point is called:

(a) ✔Circle (b) Parabola (c) Ellipse (d) Hyperbola

166. The circle whose radius is zero is called:

(a) Unit circle (b) ✔point circle (c) circumcircle (d) in-circle

167. The circle whose radius is 1 is called:

(a) ✔Unit circle (b) point circle (c) circumcircle (d) in-circle

168. The equation $x^2 + y^2 + 2gx + 2fy + c = 0$ represents the circle with centre

(a) (g, f) (b) ✔ $(-g, -f)$ (c) $(-f, -g)$ (d) $(g, -f)$

169. The equation $x^2 + y^2 + 2gx + 2fy + c = 0$ represents the circle with centre

(a) ✔$\sqrt{g^2 + f^2 - c}$ (b) $\sqrt{g^2 + f^2 + c}$ (c) $\sqrt{g^2 + c^2 - f}$ (d) $\sqrt{g + f - c}$

170. The ratio of the distance of a point from the focus to distance from the directrix is denoted by

(a) ✔r (b) R (c) E (d) e

171. Standard equation of Parabola is :

(a) $y^2 = 4a$ (b) $x^2 + y^2 = a^2$ (c) ✔ $y^2 = 4ax$ (d) $S = vt$

172. The focal chord is a chord which is passing through

(a) ✔Vertex (b) Focus (c) Origin (d) None of these

173. The curve $y^2 = 4ax$ is symmetric about

(a) ✔$y - axis$ (b) $x - axis$ (c) Both (a) and (b) (d) None of these

174. Latusrectum of $x^2 = -4ay$ is

(a) $x = a$ (b) $x = -a$ (c) $y = a$ (d) ✔ $y = -a$

175. Eccentricity of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is

(a) $\frac{a}{c}$ (b) ac (c) ✔ $\frac{c}{a}$ (d) None of these

176. Focus of $y^2 = -4ax$ is

(a) $(0, a)$ (b) ✔$(-a, 0)$ (c) $(a, 0)$ (d) $(0, -a)$

177. **A type of the conic that has eccentricity greater than 1 is**
(a) An ellipse (b) A parabola (c) ✔ A hyperbola (d) A circle

178. **$x^2 + y^2 = -5$ represents the**
(a) Real circle (b) ✔Imaginary circle (c) Point circle (d) None of these

179. **Which one is related to circle**
(a) $e = 1$ (b) $e > 1$ (c) $e < 1$ (d) ✔$e = 0$

180. **Circle is the special case of :**
(a) Parabola (b) Hyperbola (c) ✔Ellipse (d) None of these

181. **Equation of the directrix of $x^2 = -4ay$ is:**
(a) $x + a = 0$ (b) $x - a = 0$ (c) $y + a = 0$ (d) ✔ $y - a = 0$

182. **The midpoint of the foci of the ellipse is its**
(a) Vertex (b) ✔ Centre (c) Directrix (d) None of these

183. **Focus of the ellipse always lies on the**
(a) Minor axis (b) ✔Major axi (c) Directrix (d) None of these

184. **Length of the major axis of $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, $a > b$ is**
(a) ✔$2a$ (b) $2b$ (c) $\frac{2b^2}{a}$ (d) None of these

185. **In the cases of ellipse it is always true that:**
(a) ✔$a^2 > b^2$ (b) $a^2 < b^2$ (c) $a^2 = b^2$ (d) $a < 0, b < 0$

186. **Two conics always intersect each other in _____ points**
(a) No (b) one (c) two (d) ✔ four

187. **The eccentricity of ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$ is**
(a) ✔ $\frac{\sqrt{7}}{4}$ (b) $\frac{7}{4}$ (c) 16 (d) 9

188. **The foci of an ellipse are $(4, 1)$ and $(0, 1)$ then its centre is:**
(a) (4,2) (b) ✔(2,1) (c) (2,0) (d) (1,2

189. **The foci of hyperbola always lie on :**
(a) $x - axis$ (b) ✔ $Transverse\ axis$ (c) $y - axis$ (d) Conjugate axis

190. **Length of transverse axis of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is**
(a) ✔$2a$ (b) $2b$ (c) a (d) b

191. **$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is symmetric about the:**
(a) $y - axis$ (b) $x - axis$ (c) ✔Both (a) and (b) (d) None of these

1. **Two vectors are said to be negative of each other if they have the same magnitude and ___________direction.**
(a) Same (b) ✔ opposite (c) negative (d) parallel

192. **Parallelogram law of vector addition to describe the combined action of two forces, was used by**
(a) Cauchy (b) ✔ Aristotle (c) Alkhwarzmi (d) Leibnitz

193. **The vector whose initial point is at the origin and terminal point is P, is called**
(a) Null vector (b) unit vector (c) ✔position vector (d) normal vector

194. **If R be the set of real numbers, then the Cartesian plane is defined as**
(a) $R^2 = \{(x^2, y^2): x, y \in R\}$ (b) ✔ $R^2 = \{(x, y): x, y \in R\}$ (c) $R^2 = \{(x, y): x, y \in R, x = -y\}$ (d) $R^2 = \{(x, y): x, y \in R, x = y\}$

195. **The element $(x, y) \in R^2$ represents a**
(a) Space (b) ✔ point (c) vector (d) line

196. **If $\underline{u} = [x, y]$ in R^2, then $|\underline{u}| = ?$**

(a) x^2+y^2 (b) ✔ $\sqrt{x^2+y^2}$ (c) $\pm\sqrt{x^2+y^2}$ (d) x^2-y^2

197. If $|\underline{u}|=\sqrt{x^2+y^2}=0$, then it must be true that

(a) $x\geq 0, y\geq 0$ (b) $x\leq 0, y\leq 0$ (c) $x\geq 0, y\leq 0$ (d) ✔ $x=0, y=0$

198. Each vector $[x,y]$in R^2 can be uniquely represented as

(a) $x\underline{i}-y\underline{j}$ (b) ✔ $x\underline{i}+y\underline{j}$ (c) $x+y$ (d) $\sqrt{x^2+y^2}$

199. The lines joining the mid-points of any two sides of a triangle is always ____to the third side.

(a) Equal (b) ✔ Parallel (c) perpendicular (d) base

200. If $\underline{u}=3\underline{i}-\underline{j}+2\underline{k}$ then [3,-1,2] are called _________ of $\underline{u}$.

(a) Direction cosines (b) ✔ direction ratios (c) direction angles (d) elements

201. Which of the following can be the direction angles of some vector

(a) $45°, 45°, 60°$ (b) $30°, 45°, 60°$ (c) ✔$45°, 60°, 60°$ (d) obtuse

202. Measure of angle θ between two vectors is always.

(a) $0<\theta<\pi$ (b) $0\leq\theta\leq\frac{\pi}{2}$ (c) ✔$0\leq\theta\leq\pi$ (d) obtuse

203. If the dot product of two vectors is zero, then the vectors must be

(a) Parallel (b) ✔ orthogonal (c) reciprocal (d) equal

204. If the cross product of two vectors is zero, then the vectors must be

(a) ✔ Parallel (b) orthogonal (c) reciprocal (d) Non coplanar

205. If θ be the angle between two vectors $\underline{a}$ and $\underline{b}$, then $\cos\theta=$

(a) $\frac{\underline{a}\times\underline{b}}{|\underline{a}||\underline{b}|}$ (b) ✔ $\frac{\underline{a}.\underline{b}}{|\underline{a}||\underline{b}|}$ (c) $\frac{\underline{a}.\underline{b}}{|\underline{a}|}$ (d) $\frac{\underline{a}.\underline{b}}{|\underline{b}|}$

206. If θ be the angle between two vectors $\underline{a}$ and $\underline{b}$, then projection of $\underline{b}$ along $\underline{a}$ is

(a) $\frac{\underline{a}\times\underline{b}}{|\underline{a}||\underline{b}|}$ (b) $\frac{\underline{a}.\underline{b}}{|\underline{a}||\underline{b}|}$ (c) ✔ $\frac{\underline{a}.\underline{b}}{|\underline{a}|}$ (d) $\frac{\underline{a}.\underline{b}}{|\underline{b}|}$

207. If θ be the angle between two vectors $\underline{a}$ and $\underline{b}$, then projection of $\underline{a}$ along $\underline{b}$ is

(a) $\frac{\underline{a}\times\underline{b}}{|\underline{a}||\underline{b}|}$ (b) $\frac{\underline{a}.\underline{b}}{|\underline{a}||\underline{b}|}$ (c) $\frac{\underline{a}.\underline{b}}{|\underline{a}|}$ (d) ✔ $\frac{\underline{a}.\underline{b}}{|\underline{b}|}$

208. Let $\underline{u}=a\underline{i}+b\underline{j}+c\underline{k}$ then projection of $\underline{u}$ along $\underline{i}$ is

(a) ✔a (b) b (c) c (d) u

209. In any ΔABC, the law of cosine is

(a) ✔$a^2=b^2+c^2-2bcCosA$ (b) $a=bCosC+cCosB$ (c) $a.b=0$ (d) $a-b=0$

210. In any ΔABC, the law of projection is

(a) $a^2=b^2+c^2-2bcCosA$ (b) ✔ $a=bCosC+cCosB$ (c) $a.b=0$ (d) $a-b=0$

211. If $\underline{u}$ is a vector such that $\underline{u}.\underline{i}=0, \underline{u}.\underline{j}=0, \underline{u}.\underline{k}=0$ then $\underline{u}$ is called

(a) Unit vector (b) ✔ null vector (c) $[\underline{i},\underline{j},\underline{k}]$ (d) none of these

212. Cross product or vector product is defined

(a) In plane only (b) ✔in space only (c) everywhere (d) in vector field

213. If $\underline{u}$ and $\underline{v}$ are two vectors , then $\underline{u}\times\underline{v}$ is a vector

(a) Parallel to $\underline{u}$and $\underline{v}$ (b) parallel to $\underline{u}$ (c) ✔ perpendicular to $\underline{u}$ and $\underline{v}$ (d) orthogonal to $\underline{u}$

214. If $\underline{u}$ and $\underline{v}$ be any two vectors, along the adjacent sides of ||gram then the area of ||gram is

(a) $\underline{u}\times\underline{v}$ (b) ✔ $|\underline{u}\times\underline{v}|$ (c) $\frac{1}{2}(\underline{u}\times\underline{v})$ (d) $\frac{1}{2}|\underline{u}\times\underline{v}|$

215. If $\underline{u}$ and $\underline{v}$ be any two vectors, along the adjacent sides of triangle then the area of triangle is

(a) $\underline{u}\times\underline{v}$ (b) $|\underline{u}\times\underline{v}|$ (c) $\frac{1}{2}(\underline{u}\times\underline{v})$ (d) ✔ $\frac{1}{2}|\underline{u}\times\underline{v}|$

216. The scalar triple product of $\underline{a}$,$\underline{b}$ and $\underline{c}$ is denoted by

(a) $\underline{a}.\underline{b}.\underline{c}$ (b) ✔ $\underline{a}.\underline{b}\times\underline{c}$ (c) $\underline{a}\times\underline{b}\times\underline{c}$ (d) $(\underline{a}+\underline{b})\times\underline{c}$

217. Cross product or vector product is defined

(b) In plane only (b) ✔ in space only (c) everywhere (d) in vector field

218. If $\underline{u}$ and $\underline{v}$ are two vectors , then $\underline{u} \times \underline{v}$ is a vector

(b) Parallel to $\underline{u}$and $\underline{v}$ (b) parallel to $\underline{u}$ (c) ✔ perpendicular to $\underline{u}$ and $\underline{v}$ (d) orthogonal to $\underline{u}$

219. If $\underline{u}$ and $\underline{v}$ be any two vectors, along the adjacent sides of ||gram then the area of ||gram is

(b) $\underline{u} \times \underline{v}$ (b) ✔ $|\underline{u} \times \underline{v}|$ (c) $\frac{1}{2}(\underline{u} \times \underline{v})$ (d) $\frac{1}{2}|\underline{u} \times \underline{v}|$

220. If $\underline{u}$ and $\underline{v}$ be any two vectors, along the adjacent sides of triangle then the area of triangle is

(b) $\underline{u} \times \underline{v}$ (b) $|\underline{u} \times \underline{v}|$ (c) $\frac{1}{2}(\underline{u} \times \underline{v})$ (d) ✔ $\frac{1}{2}|\underline{u} \times \underline{v}|$

221. Two non zero vectors are perpendicular iff

(a) $\underline{u}.\underline{v} = 1$ (b) $\underline{u}.\underline{v} \neq 1$ (c) $\underline{u}.\underline{v} \neq 0$ (d) ✔ $\underline{u}.\underline{v} = 0$

222. The scalar triple product of $\underline{a}$,$\underline{b}$ and $\underline{c}$ is denoted by

(b) $\underline{a}.\underline{b}.\underline{c}$ (b) ✔ $\underline{a}.\underline{b} \times \underline{c}$ (c) $\underline{a} \times \underline{b} \times \underline{c}$ (d) $(\underline{a} + \underline{b}) \times \underline{c}$

223. The vector triple product of $\underline{a}$,$\underline{b}$ and $\underline{c}$ is denoted by

(a) $\underline{a}.\underline{b}.\underline{c}$ (b) $\underline{a}.\underline{b} \times \underline{c}$ (c) ✔ $\underline{a} \times \underline{b} \times \underline{c}$ (d) $(\underline{a} + \underline{b}) \times \underline{c}$

224. Notation for scalar triple product of $\underline{a}$,$\underline{b}$ and $\underline{c}$ is

(a) $\underline{a}.\underline{b} \times \underline{c}$ (b) $\underline{a} \times \underline{b}.\underline{c}$ (c)$[\underline{a}.\underline{b}.\underline{c}]$ (d) ✔ all of these

225. If the scalar product of three vectors is zero, then vectors are

(a) Collinear (b) ✔ coplanar (c) non coplanar (d) non-collinear

226. If any two vectors of scalar triple product are equal, then its value is equal to

(a) 1 (b) ✔0 (c) -1 (d) 2

227. Moment of a force $\underline{F}$ about a point is given by:

(a) Dot product (b) ✔cross product (c) both (a) and (b) (d) None of these

Short Questions

1) **(i) $x = at^2, y = 2at$ represent the equation of parabola $y^2 = 4ax$**
2) **Express the perimeter P of square as a function of its area A.**
3) **Show that $x = acos\theta$, $y = bsin\theta$ represent the equation of ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$**
4) **Show that: $\sinh 2x = 2\sinh x\cosh x$**
   Express the volume V of a cube as a function of the area A of its base.
5) **Find $\frac{f(a+h)-f(a)}{h}$ and simplify $f(x) = cosx$**
6) $f(x) = \frac{1}{\sqrt{x-1}}, x \neq 1$; $g(x) = (x^2+1)^2$
7) **(a) $f^{-1}(x)$ (b) $f^{-1}(-1)$ and verify $f(f^{-1}(x)) = f^{-1}f(x)) = xf(x) = \frac{2x+1}{x-1}, x > 1$**
8) **Show that $\lim_{x\to 0}\frac{a^x-1}{x} = \log_e a$**
9) **Evaluate $\lim_{x\to 0}\frac{Sin7x}{x}$**
10) **Evaluate $\lim_{n\to+\infty}\left(1+\frac{1}{n}\right)^{\frac{n}{2}}$**
11) $\text{Lim}_{h\to 0}\frac{\sqrt{x+h}-\sqrt{x}}{h}$
12) $\text{Lim}_{x\to 0}(1+2x^2)^{\frac{1}{x^2}}$
13) **Evaluate $\lim_{\theta\to 0}\frac{1-cos\theta}{\theta}$**
14) **Evaluate $\lim_{x\to 0}\frac{x^n-a^n}{x^m-a^m}$**
15) $\text{Lim}_{x\to 0}\frac{e^{1/x}-1}{e^{1/x}+1}, x > 0$

16) (i) $\text{Lim}_{x\to 0}\frac{\sin x^0}{x}$ (ii) $\text{Lim}_{\theta\to 0}\frac{1-\cos\theta}{\sin\theta}$ (iii) $\text{Lim}_{x\to 0}\frac{\text{sinax}}{\sin bx}$

17) Discuss the continuity of the function at $x = 3$ $g(x) = \frac{x^2-9}{x-3}$ $if\ x \neq 3$

18) Discuss the continuity of $f(x)$ at $x = c$: $f(x) = \begin{cases} 2x+5\ if\ x \leq 2 \\ 4x+1\ if\ x > 2 \end{cases}, c = 2$

19) Discuss the continuity of $f(x)$ at 3, when $f(x) = \begin{cases} x-1,\ if\ x \leq 3 \\ 2x+1\ if\ 3 \leq x \end{cases}$

20) Find the derivative of the given function by definition $f(x) = x^2$

21) Find the derivative of the given function by definition $f(x) = \frac{1}{\sqrt{x}}$

22) Find the derivative of $y = (2\sqrt{x}+2)(x-\sqrt{x})\ w.r.t\ 'x'$

23) Differentiate $\frac{2x^3-3x^2+5}{x^2+1}\ w.r.t\ 'x'$

24) If $x^4 + 2x^2 + 2$, Prove that $\frac{dy}{dx} = 4x\sqrt{y-1}$

25) Differentiate$\left(\sqrt{x}-\frac{1}{\sqrt{x}}\right)^2 w.r.t\ 'x'$.

26) Differentiate $(x-5)(3-x)$

27) Find $\frac{dy}{dx}$ if $x = \theta + \frac{1}{\theta}, y = \theta + 1$

28) Find $\frac{dy}{dx}$ by making some suitable substitution if $y = \sqrt{x+\sqrt{x}}$

29) Differentiate $x^2 + \frac{1}{x^2}\ w.r.t\ x - \frac{1}{x}$

30) Find $\frac{dy}{dx}$ if $y^2 - xy - x^2 + 4 = 0$

31) Find $\frac{dy}{dx}$ if $x^2 + y^2 = 4$

32) Find $\frac{dy}{dx}$ if $y = x^n$ where $n = \frac{p}{q}, q \neq 0$

33) If $y = (ax+b)^n$ where n is negative integer , find $\frac{dy}{dx}$ using quotient theorem.

34) Find $\frac{dy}{dx}$ if $xy + y^2 = 2$

35) Differentiate $(1+x^2)\ w.r.t\ x^2$

36) Find $\frac{dy}{dx}$ if $3x + 4y + 7 = 0$

37) Find $\frac{dy}{dx}\ if\ y = xcosy$

38) Differentiate $sin^2x\ \ w.r.t\ cos^2x$

39) Find $f'(x)$ if $f(x) = ln(e^x + e^{-x})$

40) Find $f'(x)$ if $f(x) = e^x\ (1 + lnx)$

41) Differentiate $(lnx)^x\ w.r.t\ 'x'$

42) Find $\frac{dy}{dx}$ if $y = a^{\sqrt{x}}$

43) Find $\frac{dy}{dx}$ if $y = 5e^{3x-4}$

44) Find $\frac{dy}{dx}$ if $y = (x+1)^x$

45) Find $\frac{dy}{dx}$ if $y = xe^{sinx}$

46) Find $\frac{dy}{dx}$ if $y = (ln\ tanhx)$

47) Find $\frac{dy}{dx}$ if $y = sinh^{-1}(\frac{x}{2})$

48) Find $\frac{dy}{dx}$ if $y = tanh^{-1}(sinx)$ $, -\frac{\pi}{2} < x < \frac{\pi}{2}$

49) If $y = Sin^{-1}\frac{x}{a}$, then show that $y_2 = x(a^2-x^2)^{-\frac{3}{2}}$

50) Find y_2 if $y = x^2.e^{-x}$

51) Find y_2 if $x = acos\theta, y = sin\theta$

52) Find y_2 if $x^3 - y^3 = a^3$
53) Find the first four derivatives of $cos(ax+b)$
54) Apply Maclaurin's Series expansion to prove that $e^{2x} = 1 + 2x + \frac{4x^2}{2!} + \frac{8x^3}{3!} + \cdots$
55) Apply Maclaurin's Series expansion to prove that $e^x = 1 + x + \frac{x^2}{2!} + \cdots$
56) State Taylor's series expansion.
57) Expand $cosx$ by Maclaurin's series expansion.
58) Define Increasing and decreasing functions.
59) Determine the interval in which $f(x) = x^2 + 3x + 2; x \in [-4, 1]$
60) Determine the interval in which $f(x) = Cosx\ ; x \in \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$
61) Find the extreme values of the function $f(x) = 3x^2 - 4x + 5$
62) Find the extreme values of the function $f(x) = 1 + x^3$
63) Find δy and dy if $y = x^2 + 2x$ when x changes from 2 to 1.8
64) Use differentials find $\frac{dy}{dx}$ and $\frac{dx}{dy}$ in the following equations.
65) $xy + x = 4$ (b) $xy - lnx = c$
66) Find the approximate increase in the volume of a cube if the length of its each edge changes from 5 to 5.02
67) Find the approximate increase in the area of a circular disc if its diameter is increased form 44cm to 44.4cm.
68) Define integration.
69) Evaluate $\int(\sqrt{x}+1)^2 dx$
70) Evaluate $\int \frac{\sqrt{y}(y+1)}{y} dx$
71) Evaluate $\int \frac{3-cos2x}{1+cos2x} dx$
72) Evaluate $\int x\sqrt{x^2-1}\, dx$
73) Prove that $\int [f(x)^n f'(x) dx = \frac{[f(x)]^{n+1}}{n+1} + c, n \neq -1$
74) Evaluate $\int \frac{(1+e^x)^3}{e^x} dx$
75) Evaluate $\int (lnx) \times \frac{1}{x} dx$
76) Evaluate $\int \frac{sinx + cos^3x}{cos^2x sinx} dx$
77) Evaluate $\int \frac{1-x^2}{1+x^2} dx$
78) Evaluate $\int \frac{cos2x-1}{1+cos2x} dx$
79) Evaluate $\int \sqrt{1-cos2x}\, dx$
80) Evaluate $\int (a-2x)^{\frac{3}{2}} dx$
81) Evaluate $\int \frac{1}{xlnx} dx$
82) Evaluate $\int \frac{x^2}{4+x^2} dx$
83) Evaluate $\int \frac{e^x}{e^x+3} dx$
84) Evaluate $\int \frac{sec^2x}{\sqrt{tanx}} dx$
85) Evaluate $\int \frac{cosx}{sinx\,lnsinx} dx$
86) Evaluate $\int \frac{\sqrt{2}}{sinx+cosx} dx$
87) Evaluate $\int cosx \left(\frac{lnsinx}{sinx}\right) dx$
88) Evaluate $\int \frac{dx}{x(ln2x)^3}, (x > 0)$

89) Find $\int a^{x^2}.xdx$, $(a > 0, a \neq 1)$

90) Evaluate $\int \frac{1}{(1+x^2)Tan^{-1}x} dx$

91) Evaluate $\int lnxdx$

92) Evaluate $\int x^3 lnxdx$

93) Evaluate $\int xTan^{-1}x\, dx$

94) Evaluate $\int \frac{xSin^{-1}x}{\sqrt{1-x^2}} dx$

95) Evaluate $\int x^2 e^{ax} dx$

96) Evaluate $\int tan^4 x$

97) Evaluate $\int \frac{e^{mTan^{-1}x}}{(1+x^2)} dx$

98) Evaluate $\int e^x \left(\frac{1}{x} + lnx\right) dx$

99) Evaluate $\int \left(\frac{1-sinx}{1-cosx}\right) e^x dx$

100)

101) Evaluate $\int \frac{2a}{a^2-x^2} dx$

102) Evaluate $\int \frac{5x+8}{(x+3)(2x-1)} dx$

103) Evaluate $\int \frac{(a-b)x}{(x-a)(x-b)} dx$

104) Evaluate $\int_0^3 \frac{dx}{x^2+9}$

105) Evaluate $\int_1^2 \frac{x}{x^2+2} dx$

106) Evaluate $\int_1^2 lnxdx$

107) Evaluate $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} costdt$

108) Evaluate $\int_0^{\frac{\pi}{6}} xcosxdx$

109) Evaluate $\int_0^2 (e^{\frac{x}{2}} - e^{-\frac{x}{2}})dx$

110) Evaluate $\int_{-1}^5 |x-3|dx$

111) Evaluate $\int_{-2}^1 \frac{1}{(2x-1)^2} dx$

112) Evaluate $\int_2^3 \left(x - \frac{1}{x}\right)^2 dx$

113) Evaluate $\int_1^2 \left(x + \frac{1}{x}\right)^{\frac{1}{2}} \left(1 - \frac{1}{x^2}\right) dx$

114) Find the area bounded by the curve $y = x^3 + 3x^2$ and the $x - axis$.

115) Find the area between the $x - axis$ and the curve $y^2 = 4 - x$ in the first quadrant from $x = 0$ to $x = 3$.

116) Find the area bounded by cos function from $y = -\frac{\pi}{2}$ to $\frac{\pi}{2}$.

117) Find the area between the $x - axis$ and the curve $y = cos\frac{1}{2}x$ form $-\pi$ to π.

118) Solve $\frac{dy}{dx} = \frac{y^2+1}{e^{-x}}$

119) Solve $\frac{1}{x}\frac{dy}{dx} - 2y = 0$

120) Solve $\frac{dy}{dx} = \frac{3}{4}x^2 + x - 3$, if $y = 0$ and $x = 2$

121) Solve $\frac{dy}{dx} = \frac{y}{x^2}$, $(y > 0)$

122) Solve $\frac{dy}{dx} = \frac{1-y}{y}$

123) Solve $(e^x + e^{-x})\frac{dy}{dx} = e^x - e^{-x}$

124) Solve $secx + tany\frac{dy}{dx} = 0$

125) Solve $1 + cosx\ tany\frac{dy}{dx} = 0$

126) Solve $\frac{dy}{dx} = -y$

127) Show that the points $A(3,1), B(-2,-3)$ and $C(2,2)$ are vertices of an isosceles triangle.

128) Find the mid-point of the line segment joining the vertices $A(-8,3), B(2,-1)$.

129) Show that the vertices $(-1,2)$, $B(7,5), C(2,-6)$ are vertices of a right triangle.

130) Find the points trisecting the join of $A(-1,-4)$ and $B(6,2)$.

131) Find h such that $(-1,h)$, $B(3,2), and\ C(7,3)$ are collinear.

132) Describe the location in the plane of point $P(x,y)$ for whcih $x = y$.

133) The point $C(-5,3)$ is the centre of a circle and $P(7,-2)$ lies on the circle. What is the radius of the circle?

134) Find the point three-fifth of the way along the line segment from $A(-5,8)$ to $B(5,3)$.

135) The two points P and O' are given in xy –coordinate system. Find the XY-coordinates of P referred to the translated axes $O'X$ and $O'Y$ if $P(-2,6)$ and $O'(-3,2)$.

136) The xy-coordinate axes are translated through point O' whose coordinates are given in xy –coodinate system. The coordinates of P are given in the XY –coodinate system. Find the coordinates of P in xy-coordiante system if $(-5,-3)$, $O'(-2,3)$.

137) What are translated axes.

138) Show that the points $A(-3,6), B(3,2)$ and $C(6,0)$ are collinear.

139) Find an equation of the straight line if its slope is 2 and $y - axis$ is 5.

140) Find the slope and inclination of the line joining the points $(-2,4); (5,11)$

141) Find k so that the line joining $A(7,3); B(k,-6)$ and the line joining $C(-4,5); D(-6,4)$ are perpendicular.

142) Find an equation of the line bisecting the I and III quadrants.

143) Find an equation of the line for $x - intercept: -3$ and $y - intercept: 4$

144) Find the distance from the point $P(6,-1)$ to the line $6x - 4y + 9 = 0$

145) Find whether the given point $(5,8)$ lies above or below the line $2x - 3y + 6 = 0$

146) Check whether the lines are concurrent or not. $3x - 4y - 3 = 0; 5x + 12y + 1 = 0 ; 32x + 4y - 17 = 0$

147) Transform the eqution $5x - 12y + 39 = 0$ to "Two-intercept form".

148) Find the point of intersection of the lines $x - 2y + 1 = 0$ and $2x - y + 2 = 0$

149) Find an equation of the line through the point $(2,-9)$ and the intersection of the lines $2x + 5y - 8 = 0$ and $3x - 4y - 6 = 0$.

150) Determine the value of p such that the lines $2x - 3y - 1 = 0, 3x - y - 5 = 0$ and $3x + py + 8 = 0$ meet at a point.

151) Find the angle measured from the line l_1 to the line l_2 where l_1: Joining $(2,7)$ and $(7,10)$ l_2: Joining $(1,1)$ and $(-5,5)$

152) Express the given system of equations in matrix form $2x + 3y + 4 = 0; x - 2y - 3 = 0; 3x + y - 8 = 0$

153) Find the angle from the line with slope $-\frac{7}{3}$ to the line with slope $\frac{5}{2}$.

154) Find an equation of each of the lines represented by $20x^2 + 17xy - 24y^2 = 0$

155) Define Homogenous equation.

156) Write down the joint equation.

157) Find a joint equation of the straight lines through the origin perpendicular to the lines represented by $x^2 + xy - 6y^2 = 0$.

158) Find measure of angle between the lines represented by $x^2 - xy - 6y^2 = 0$.

159) Define "Corner Point" or "Vertex".

160) Graph the solution set of linear inequality $3x + 7y \geq 21$.

161) Indicate the solution set of $3x + 7y \geq 21$; $x - y \leq 2$

162) What is "Corresponding equation".

163) Graph the inequality $x + 2y < 6$.
164) Graph the feasible region of $x + y \leq 5$; $-2x + y \leq 0$ $x \geq 0; y \geq 0$
165) Graph the feasible region of $5x + 7y \leq 35; x - 2y \leq 4$ $x \geq 0; y \geq 0$
166) Define "Feasible region".
167) Graph the feasible region of $2x - 3y \leq 6; 2x + y \geq 2$ $x \geq 0; y \geq 0$
168) Write the equation of the circle with centre $(-3, 5)$ and radius.
169) Find the equation of the circle with ends of a diameter at $(-3, 2)$ and $(5, -6)$.
170) Find the centre and radius of the circle of $x^2 + y^2 + 12x - 10y = 0$
171) Analyze the parabola $x^2 = -16y$
172) Write an equation of the parabola with given elements
Focus $(-3, 1)$; directrix $x = 3$ directrix $x = -2$, Focus $(2, 2)$
173) Directrix $= 3$; vertex $(2, 2)$
174) Analyze the equation $4x^2 + 9y^2 = 36$
175) Find the equation of the ellipse with given data :
176) Foci $(\pm 3, 0)$ and minor axis of length 10
177) Vertices – $1, 1), (5, 1)$; Foci $(4, 1)$ and $(0, 1)$
178) Centre $(0, 0)$, focus $(0, -3)$, vertex $(0, 4)$
179) Find the centre , foci , eccentricity , vertices and directrices of the ellipse whose equations are given :
$9x^2 + y^2 = 18$, $25x^2 + 9y^2 = 225$
180) Discuss $25x^2 - 16y^2 = 400$
181) Find the equation of hyperbola with given data : Foci $(\pm 5, 0)$, vertex $(3, 0)$
182) Foci $(0, \pm 6), e = 2$, Foci $(5, -2), (5, 4)$ and one vertex $(5, 3)$
183) Find the centre ,foci , eccentricity , vertices and directrix of $x^2 - y^2 = 9$
184) $\frac{y^2}{4} - x^2 = 1$, $\frac{y^2}{16} - \frac{x^2}{9} = 1$
185) Find equations of the common tangents to the two conics $\frac{x^2}{16} + \frac{y^2}{25} = 1$ and $\frac{x^2}{25} + \frac{y^2}{9} = 1$
186) Find the points of intersection of the ellipse $\frac{x^2}{\frac{43}{3}} + \frac{y^2}{\frac{43}{4}} = 1$ and the hyperbola $\frac{x^2}{7} - \frac{y^2}{14} = 1$
187) Find the points of intersection of the conics $x^2 + y^2 = 8$ and $x^2 - y^2 = 1$
188) Find equations of the common tangents to the given conics $y^2 = 16x$ and $x^2 = 2y$
189) Find equations of the tangents to the conic $9x^2 - 4y^2 = 36$ parallel to $5x - 2y + 7 = 0$
190) Transform the equation $x^2 + 6x - 8y + 17 = 0$ referred to the origin $O'(-3, 1)$ as origin, axes remaining parallel to the old axes.
191) Find an equation of $5x^2 - 6xy + 5y^2 - 8 = 0$ with respect to new axes obtained by rotation of axes about the origin through an angle of $135°$.
192) Write the vector $\overrightarrow{PQ}$ in the form of $x\underline{i} + y\underline{j}$ if $P(2, 3), Q(6, -2)$
193) Find the sum of the vectors $\overrightarrow{AB}$ and $\overrightarrow{CD}$, given the four points $A(1, -1), B(2, 0), C(-1, 3)$ and $D(-2, 2)$
194) Find the unit vector in the direction of vector given $\underline{v} = \frac{1}{2}\underline{i} + \frac{\sqrt{3}}{2}\underline{j}$
195) If $\overrightarrow{AB} = \overrightarrow{CD}$. Find the coordinates of the points A when points B, C, D are $(1, 2), (-2, 5), (4, 11)$ respectively.
196) If B, C and D are respectively $(4, 1), (-2, 3)$ and $(-8, 0)$. Use vector method to find the coordinates of the point A if $ABCD$ is a parallelogram.
197) Define Parallel vectors.
198) Find α, so that $\left|\alpha\underline{i} + (\alpha + 1)\underline{j} + 2\underline{k}\right| = 3$
199) Find a vector whose magnitude is 4 and is parallel to $2\underline{i} - 3\underline{j} + 6\underline{k}$.
200) Find a and b so that the vectors $3\underline{i} - \underline{j} + 4\underline{k}$ and $a\underline{i} + b\underline{j} - 2\underline{k}$ are parallel.
201) Find the direction cosines for the given vector: $\underline{v} = 3\underline{i} - \underline{j} + 2\underline{k}$

202) Find Two vectors of length 2 parallel to the vector $\underline{v} = 2\underline{i} - 4\underline{j} + 4\underline{k}$.

203) Calculate the projection of $\underline{a}$ along $\underline{b}$ if $\underline{a} = \underline{i} - \underline{k}$, $\underline{b} = \underline{j} + \underline{k}$

204) Find a real number α so that the vectors $\underline{u}$ and $\underline{v}$ are perpendicular $\underline{u} = 2\alpha\underline{i} + \underline{j} - \underline{k}$, $\underline{v} = \underline{i} + \alpha\underline{j} + 4\underline{k}$

205) If $\underline{v}$ is a vector for which $\underline{v}.\underline{i} = 0$, $\underline{v}.\underline{j} = 0$, $\underline{v}.\underline{k} = 0$ find $\underline{v}$.

206) Find the angle between the vectors $\underline{u} = 2\underline{i} - \underline{j} + \underline{k}$ and $\underline{v} = \underline{-i} + \underline{j}$

207) If $\underline{u} = 2\underline{i} - \underline{j} + \underline{k}$ and $\underline{v} = 4\underline{i} + 2\underline{j} - \underline{k}$, find $\underline{u} \times \underline{v}$ and $\underline{v} \times \underline{u}$

208) Find the area of triangle, determined by the point $P(0,0,0)$; $Q(2,3,2)$; $R(-1,1,4)$

209) Find the area of $||^m$, whose vertices are: $A(1,2,-1)$; $B(4,2,-3)$; $C(6,-5,2)$; $D(9,-5,0)$

210) Which vectors, if any, are perpendicular or parallel

211) $\underline{u} = \underline{i} + 2\underline{j} - \underline{k}$; $\underline{v} = \underline{-i} + \underline{j} + \underline{k}$; $\underline{w} = -\frac{\pi}{2}\underline{i} - \pi\underline{j} + \frac{\pi}{2}\underline{k}$

212) If $\underline{a} + \underline{b} + \underline{c} = 0$, then prove that $\underline{a} \times \underline{b} = \underline{b} \times \underline{c} = \underline{c} \times \underline{a}$

213) If $\underline{a} \times \underline{b} = 0$ and $\underline{a}.\underline{b} = 0$, what conclusion can be drawn about $\underline{a}$ or $\underline{b}$?

214) What are coplanar vectors?

215) A force $\underline{F} = 7\underline{i} + 4\underline{j} - 3\underline{k}$ is applied at $P(1,-2,3)$. Find its moment about the point $Q(2,1,1)$.

216) Find work done by $\underline{F} = 2\underline{i} + 4\underline{j}$ if its points of application to a body moves if from $A(1,1)$ to $B(4,6)$.

217) Prove that the vectors $\underline{i} - 2\underline{j} + \underline{k}, -2\underline{i} + 3\underline{j} - 4\underline{k}$ and $\underline{i} - 3\underline{j} + 5\underline{k}$ are coplanar.

218) If $\underline{a} = 3\underline{i} - \underline{j} + 5\underline{k}, \underline{b} = 4\underline{i} + 3\underline{j} - 2\underline{k}$ and $\underline{c} = 2\underline{i} + 5\underline{j} + \underline{k}$ fine $\underline{a}.\underline{b} \times c$

219) Find the volume of tetrahedron with the vertices $A(0,1,2)$, $B(3,2,1)$, $C(1,2,1)$ and $D(5,5,6)$.

220) Find the value of $2\underline{i} \times 2\underline{j}.\underline{k}$ and $[k \;\; i \;\; j]$

221) Prove that $\underline{u}.(\underline{v} \times \underline{w}) + \underline{v}.(\underline{w} \times \underline{u}) + \underline{w}.(\underline{u} \times \underline{v}) = 3\underline{u}.(\underline{v} \times \underline{w})$

222) Find the value of , so that $\alpha\underline{i} + \underline{j}, \underline{i} + \underline{j} + 3\underline{k}$ and $2\underline{i} + \underline{j} - 2\underline{k}$ are coplanar.

Long Questions

1) Given $f(x) = x^3 - ax^2 + bx + 1$ If $f(2) = -3$ and $f(-1) = 0$. Find a and b.

2) For the real valued function , f defined below , find $f^{-1}(x)$ and verify

$$f\left(f^{-1}(x)\right) = (f^{-1}\left(f(x)\right) = x \text{ if } f(x) = -2x + 8$$

3) Prove that $if\ \theta\ is\ measured\ in\ radian\ , then\ \lim_{\theta \to 0} \frac{Sin\theta}{\theta} = 1$

a. Evaluate $\lim_{\theta \to 0} \frac{tan\theta - sin\theta}{sin^3\theta}$

4) Find the values of m and n , so that given function f is continuous at $x = 3$

5) $f(x) = \begin{cases} mx & if \quad x < 3 \\ n & if \quad x = 3 \\ -2x + 9 & if \quad x > 3 \end{cases}$

6) If $f(x) = \begin{cases} \frac{\sqrt{2x+5} - \sqrt{x+7}}{x-2} & , \ x \neq 2 \\ k & , \ x = 2 \end{cases}$ Find the value of k so that f is continuous at $x =$

7) Find from first Principles , the derivative $w.r.t$ 'x' $(ax + b)^3$

8) Find from first principles the derivative of $\frac{1}{(az-b)^7}$

9) Differentiate $\sqrt{\frac{a-x}{a+x}}\, w.r.t\ 'x'$.

10) Find $\frac{dy}{dx}$ if $y = \frac{(1+\sqrt{x})(x - x^{\frac{3}{2}})}{\sqrt{x}}$

11) Prove that $y\frac{dy}{dx}+x=0\ if\ x=\frac{1-t^2}{1+t^2}$, $y=\frac{2t}{1+t^2}$
12) Differentiate $\frac{ax+b}{cx+d}$ $w.r.t$ $\frac{ax^2+b}{ax^2+d}$
13) Show that $\frac{dy}{dx}=\frac{y}{x}\ if \frac{y}{x}=Tan^{-1}\frac{x}{y}$
14) Differentiate $cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)$
15) Differentiate $\sqrt{tanx}$ from first principles.
16) If $x=acos^3\theta, y=bsin^3\theta$, show that $a\frac{dy}{dx}+btan\theta=0$
17) Find $f'(x)$ if $f(x)=\sqrt{ln(e^{2x}+e^{-2x})}$
18) Find $\frac{dy}{dx}$ if $y=ln\left(x+\sqrt{x^2+1}\right)$
19) Find $f'(x)$ if $f(x)=\frac{e^{ax}-e^{-ax}}{e^{ax}+e^{-ax}}$
20) If $y=acos(lnx)+bsin(lnx)$, prove that $x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}=0$
21) If $y=e^xsinx$, show that $\frac{d^2y}{dx^2}-2\frac{dy}{dx}+2y=0$
22) If $y=\left(cos^{-1}x\right)^2$, prove that $(1-x^2)y_2-xy_1-2=0$
23) Show that $2^{x+h}=2x[1+(ln2)h+(ln2)^2\frac{h^2}{2!}+\ (ln2)^3\frac{h^3}{3!}+\cdots$
24) Show that $cos(x+h)=cosx-hsinx+\frac{h^2}{2!}\ cosx+\frac{h^3}{3!}sinx+\cdots$ and evaluate $cos61°$
25) Show that $y=\frac{lnx}{x}$ has maximum value at $x=e$.
26) Show that $y=x^x$ has minimum value at $x=\frac{1}{e}$.
27) Use differentials, find the approximate value of $sin46°$.
28) Use differentials to approximate the values of $\sqrt[4]{17}$.
29) Show that $\int\sqrt{a^2-x^2}dx=\frac{a^2}{2}Sin^{-1}\frac{x}{2}+\frac{x}{2}\sqrt{a^2-x^2}+c$
30) Show that $\int\frac{dx}{\sqrt{x^2-a^2}}=ln\left(x+\sqrt{x^2-a^2}\right)+c$
31) Evaluate $\int sin^4xdx$
32) Find $\int e^{ax}cosbxdx$
a. Evaluate $\int\sqrt{4-5x^2}dx$
33) Show that $\int e^{ax}sinbx=\frac{1}{\sqrt{a^2+b^2}}e^{ax}\,sin\left(bx-Tan^{-1}\frac{b}{a}\right)+c$
a. Evaluate $\int e^{2x}cos3xdx$
34) Evaluate $\int\frac{x-2}{(x+1)(x^2+1)}dx$
35) Evaluate $\int\frac{2x^2}{(x-1)^2(2x+3)}dx$
36) Evaluate $\int_0^{\frac{\pi}{4}}(1+cos^2\theta)tan^2\theta\,d\theta$
37) Evaluate $\int_0^1\frac{3x}{\sqrt{4-3x}}dx$
38) Evaluate $\int_{\frac{\pi}{6}}^{\frac{\pi}{4}}cos^2\theta cot^2\theta d\theta$
39) Find the area between the curve $y=x(x-1)(x+1)$ and the $x-axis$.
40) Find the area between the $x-axis$ and the curve $y=\sqrt{2ax-x^2}$ when $a>0$.
41) Find the area between bounded by $y=x(x^2-4)$ and the $x-axis$

42) Find h such that the quadrilateral with vertices $(-3,0)$, $B(1,-2)$, $C(5,0)$ and $D(1,h)$ is parallelogram. Is it a square?
43) Find the points that divide the line segment joining $A(x_1,y_1)$ and $B(x_2,y_2)$ into four equal parts.
44) The xy −coordiante axes are rotated about the origin through the indicated angle. The new axes are $O'X$ and $O'Y$.Find the XY-cooridiantes of the point P with the given
45) xy-coordinates if $P(15,10)$ and $\theta = arctan\frac{1}{3}$
46) The xy −coordinte axes are rotated about the origin through the indicated angle and the new axes are OX and OY. Find the xy −coordinates of P and with the given XY-coordiantes if $P(-5,3)$ and $\theta = 30°$
a. $3x-4y+3=0$; $3x-4y+7=0$
47) The points $A(-1,2)$, $B(6,3)$ and $C(2,-4)$ are vertices of a triangle. Show that the line joining the midpoint D of AB and the midpoint E of AC is parallel to BC and $DE = \frac{1}{2}BC$.
48) Find the interior angles of the triangle whose vertices are $A(6,1)$, $B(2,7)$, $C(-6,-7)$
49) Find the area of the region bounded by the triangle whose sides are

$$7x-y-10=0\ ;10x+y-41=0\ ;\ 3x+2y+3=0$$

50) Find the interior angles of the quadrilateral whose vertices are $A(5,2)$, $B(-2,3)$, $C(-3,-4)$ and $D(4,-5)$
51) Find the lines represented by $x^2+2xysec\alpha+y^2=0$ and also find measure of the angle between them.
52) Find a join equation of the lines through the origin and perpendicular to the lines: $x^2-2xytan\alpha-y^2=0$
53) Find a joint equation of the lines through the origin and perpendicular to the lines $ax^2+2hxy+by^2=0$
54) Graph the following system of inequalities
a. $2x+y\geq 2\ ;x+2y\leq 10\ ;y\geq 0$
55) Graph the following system of inequalities and find the corner points
a. $x+y\leq 5\ ;\ -2x+y\leq 0\ ;y\geq 0$
56) Graph the solution region of the following system of linear inequalities by shading
a. $2x+3y\leq 18\ ;2x+y\leq 10\ ;\ -2x+y\leq 10$
57) Graph the feasible region and find the corner points of
1. $2x+y\leq 10; x+4y\leq 12; x+2y\leq 10\quad x\geq 0; y\geq 0$
58) Graph the feasible region and find the corner points of
1. $2x+y\leq 20\ ;8x+15y\leq 120\ ;x+y\leq 11\quad x\geq 0\ ;y\geq 0$
59) Maximize $f(x,y)=x+3y$ subject to constraints
a. $2x+5y\leq 30\ ;5x+4y\leq 20\quad x\geq 0\ ;y\geq 0$
60) Minimize $z=3x+y$ subject to constraints
1. $3x+5y\geq 15\ ;x+6y\geq 9\quad x\geq 0\ ;y\geq 0$
61) Maximize $f(x,y)=2x+5y$ subject to constraints
1. $2y-x\leq 8$; $x-y\leq 4$ $\quad x\geq 0\ ;y\geq 0$
62) Find an equation of the circle passing through $A(3,-1)$, $B(0,1)$ and having centre at $4x-3y-3=0$
63) Show that the circles $x^2+y^2+2x-8=0$ and $x^2+y^2-6x+6y-46=0$ touch internally.
64) Find the equation of the circle of radius 2 and tangent to the line $x-y-4=0$ at $A(1,-3)$
65) Show that the lines $3x-2y=0$ and $2x+3y-13=0$ are tangents to the circle $x^2+y^2+6x-4y=0$
66) Find the length of the chord cut off from the line $2x+3y=13$ by the circle $x^2+y^2=26$
67) Find the length of the tangent drawn from the point $(-5,4)$ to the circle $5x^2+5y^2-10x+15y-131=0$
68) Find an equation of the chord of contact of the tangents drawn from $(4,5)$ to the circle $2x^2+2y^2-8x+12y+21=0$
69) Prove that length of a diameter of the circle $x^2+y^2=a^2$ is $2a$.

70) Find an equation of the parabola having its focus at the origin and directrix parallel to the (i) $x - axis$ (ii) $y - axis$
71) Prove that the letusrectum of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is $\frac{2b^2}{a}$.
72) Let a be a positive number and $0<c<a$. Let $F(-c,0)$ and $F'(c,0)$ be two given points. Prove that the locus of points $P(x,y)$ such that $|PF|+|PF'|=2a$, is an ellipse.

a. For any point on the hyperbola the difference of its distances from the points $(2,2)$ and $(10,2)$ is 6. Find the equation of hyperbola
b. Let $0<a<c$ and $F'(-c,0), F(c,0)$ be two fixed points . Show that th set of points $P(x,y)$ such that
c. $|PF|-|PF'|=\pm 2a$ is the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{c^2-a^2}=1$
d. Show that the product of the distances from the foci to any tangent to the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ is constant.

73) Find equations of tangent and normal to each of the following at the indicated point: $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ at $(a\cos\theta, b\sin\theta)$
74) Find the points of intersection of the given conics $4x^2+y^2=16$ and $x^2+y^2+y+8=0$
75) Find an equation referred to the new axes obtained rotation of axes about the origin through the given angle:
76) $7x^2-8xy+y^2-9=0$, $\theta = arctan2$
77) $9x^2+12xy+4y^2-x-y=0$, $\theta = arctan\frac{2}{3}$
78) Find measure of the angle through which the axes be rotated so that the product term XY is removed from the transformed equation. Also find the transformed equation: $xy+4x-3y-10=0$
79) Find an equation of the tangent to each of the given conic at the indicated point: $3x^2-7y^2+2x-y-48=0$ at $(4,1)$
80) Find an equation of the tangent to the conic $x^2-xy+y^2-2=0$ at the point whose ordinate is $\sqrt{2}$.
81) Prove that the line segment joining the mid points of two sides of a triangle is parallel to the third side and half as long.
82) The position vectors of the points A, B, C and D are $2\underline{i}-\underline{j}+\underline{k}$, $3\underline{i}+\underline{j}$, $2\underline{i}+4\underline{j}-2\underline{k}$ and $-\underline{i}-2\underline{j}+\underline{k}$ respectively. Show that $\overrightarrow{AB}$ is parallel to $\overrightarrow{CD}$.
83) Prove that $cos(\alpha+\beta) = \beta cos\alpha sin\beta - sin\alpha cos\beta$
84) Prove that the altitudes of a triangle are concurrent.
85) Prove that : $sin(\alpha-\beta) = sin\alpha cos\beta - cos\alpha sin\beta$
86) Prove that : $\underline{a}\times(\underline{b}+\underline{c})+\underline{b}\times(\underline{c}+\underline{a})+\underline{c}\times(\underline{a}+\underline{b})=0$
87) Prove that the points whose position vectors are $(-6\underline{i}+3\underline{j}+2\underline{k})$, $B(3\underline{i}-2\underline{j}+4\underline{k})$, $C(5\underline{i}+7\underline{j}+3\underline{k})$ and $D(-13\underline{i}+17\underline{j}-\underline{k})$ are coplanar. A force of magnitude 6 units acting parallel to $2\underline{i}-2\underline{j}+\underline{k}$ displces, the point of application from $(1,2,3)$ to $(5,3,7)$. Find the work done.