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Maths (050)

Section : A

(1) For A (-2, 3) and (3, 0) find the ratio in which the y- axis divides $\overline{AB}$ from A's side.

(A) -2 : 3 (B) 2 : 3

(C) 3 : 2 (D) -3 : 2

(2) {k/(k, 1), (2, 1), (3, 2) are collinear} =

(A) R (B) R – {1}

(C) ϕ (D) R^+

(3) In which ratio does the X-axis divide the line segment joining A (3, 5), B (2, 7) from A's side ?

(A) 5 : 7 (B) -5 : 7

(C) -7 : 5 (D) 7 : 5

(4) Circumcentre of triangle formed by (0, 0), (1, 0), (0, 1) is :

(A) (0, 0) (B) (1, 0)

(C) (1/2, 1/2) (D) (1, 1)

(5) If $(a + 3)x + (a^2 - 9)y + (a - 3) = 0$ passes through origin the value of a is :

(A) 3 (B) -3

(C) 0 (D) None of these

(6) Orthocentre of triangle formed by (0, 0), (3, 0), (0, 4) is :

(A) (0, 0), (B) (1, 4/3)

(C) $\left(\frac{3}{2}, 2\right)$ (D) (3, 0)

(7) Two of the vertices of a triangle are (1, -6) and (-5, 2) The centroid of the triangle is (-2, 1) Find the third vertex of the triangle.

(A) (-6, -3) (B) (2, -7)

(C) (-2, 6) (D) (-2, 7)

(8) If the origin is shifted to (3, 2) new co-ordinates of (5,1) are :

(A) (8, 3) (B) (2, -1)

(C) (-2, 1) (D) (-8, 3)

(9) To which point should the origin be shifted so that the new co-ordinates of (7,2) would be (-1,3) ?

(A) (8, -1) (B) (-1, 8)

(C) (-8, 1) (D) (7, 2)

(10) If (3,5) and (-3, -3) are mid-points of sides $\overline{AB}$ and $\overline{AC}$ of ΔABC then BC =

(A) 30 (B) 20

(C) 4 (D) 16

(11) Perpendicular distance between the lines $x = 3$ and $x = -3$ is :

(A) 3 (B) -3

(C) 6 (D) -6

(12) The measure of the angle between $x = 3$ and $y = 5$ is :

(A) $\frac{\pi}{2}$ (B) $\frac{\pi}{3}$

(C) $\frac{\pi}{6}$ (D) $\frac{\pi}{4}$

(13) The set of values of a for which $(a^2 + 4) x + (a^2 - 4) y + a = 0$ is parallel to x - axis is :

(A) $\{2\}$ (B) $\{-2, 2\}$

(C) $\{0\}$ (D) ϕ

(14) X-intercept of $3x + 2y = 6$ is

(A) 1 (B) 2

(C) 3 (D) 6

(15) Perpendicular distance between $5x + 12y + 13 = 0$ અને $5x + 12y - 9 = 0$ is :

(A) $\frac{22}{17}$ (B) $\frac{11}{13}$

(C) $\frac{22}{13}$ (D) $\frac{13}{22}$

(16) Vertical tangent of $(y - 1)^2 = 4(x + 1)$ has equation

(A) $x = 0$ (B) $x = -1$

(C) $y = 0$ (D) $y = -1$

(17) A (1, 2) and B (3, 5) $p(x, y) \in \overline{AB}$ Then minimum value of $3x + 2y$ is

(A) 12 (B) 7

(C) 19 (D) 5

(18) Perpendicular distance of (1,1) from $12x + 5y - 30 = 0$ is :

(A) -1 (B) 1

(C) 2 (D) 13

(19) The parametric equations of a line are $x = 2t + 4$, $y = t - 2$, $t \in R$ If the x-co ordinate of a point on this line is -10 then find the y-co ordinate of this point.

(A) -10 (B) 10

(C) -9 (D) 9

(20) Equation of a line passing through A (2, 3) and B (7, 5) is

(A) $2x + 5y + 11 = 0$ (B) $2x - 5y - 11 = 0$

(C) $2x + 5y - 11 = 0$ (D) $2x - 5y + 11 = 0$

(21) If the slope of the line is not defined then such line is

(A) Parallel to x-axis (B) Parallel to y-axis

(C) Parallel to $x + y = 0$ (D) Parallel to $x - y = 0$

(22) Equation of a line passes through (2, 3) and (2, -1) is :

(A) $x = 2$ (B) $y = 2$

(C) $x + y + 5 = 0$ (D) $4x - y - 9 = 0$

(23) Measure of the angle between the pair of lines $y=7$ and $x - y + 4 = 0$ is :

(A) $\frac{\pi}{3}$ (B) $\frac{\pi}{6}$

(C) $\frac{\pi}{4}$ (D) $\frac{\pi}{2}$

(24) Measure of the angle between the pair of lines $x = 2$ and $\sqrt{3}x - y = 1$ is :

(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{3}$

(C) $\frac{\pi}{4}$ (D) $\frac{\pi}{2}$

(25) X-intercept of line $y = 0$ is :

(A) 0 (B) 1

(C) -1 (D) does not exist

(26) Find K so that the lines $kx - 2y - 1 = 0$ and $6x - 4y - m = 0$ are identical

(A) 2 (B) 3

(C) -3 (D) -2

(27) The set of values of k for which lines $x + 2y = 5$, $2x + 4y = k$ and $x - y = 6$ are concurrent is :

(A) $\{0\}$ (B) $\{0, 10\}$

(C) ϕ (D) $K \in R$

(28) The value of m for which lines $y = mx$, $x + 2y - 1 = 0$ and $2x - y + 3 = 0$ are concurrent

(A) 1 (B) 2

(C) -1 (D) -2

(29) Perpendicular distance of a line $x + 3 = 0$ from the origin is :

(A) -3 (B) 3

(C) 0 (D) does not exist

(30) Orthocentre of a triangle formed by lines x = 0, y = 0 and x + y = 1 is :

(A) $\left(-\frac{1}{2},\frac{1}{2}\right)$ (B) $\left(\frac{1}{3},\frac{1}{3}\right)$

(C) (0, 0) (D) (-1, 1)

(31) From which point on the x-axis is the perpendicular distance to the line $4x + 3y = 12$ equal to 4 ?

(A) (-2, 0) (B) (3, 0)

(C) (2, 0) (D) (-8, 0)

(32) How many tangents to the circle $x^2 + y^2 = 29$ pass through the point (2,5) ?

(A) 0 (B) 1

(C) 2 (D) 3

(33) If the equation $2x^2 + 2y^2 - 6x + 8y + k = 0$ represents a circle then value of k is :

(A) 50 (B) 25

(C) $\frac{25}{2}$ (D) $\frac{-25}{2}$

(34) The length of chord cut off from x-axis by $x^2 + y^2 + 2gx + 2fy + c = 0$ is :($g^2>c$) $f^2>c$)

(A) $2\sqrt{g^2-c}$ (B) $2\sqrt{f^2-c}$

(C) $\sqrt{g^2-c}$ (D) $\sqrt{f^2-c}$

(35) Find length of tangent from (6, -5) to $x^2 + y^2 = 49$

(A) $2\sqrt{3}$ (B) 12

(C) $\sqrt{3}$ (D) 2

(36) Centre of a circle $x^2 + y^2 - 2x - 2y - 1 = 0$ is :

(A) (1, 1) (B) (-1, -1)

(C) (0, 0) (D) (2, 2)

(37) Radius of a circle $x^2 + y^2 - 2x + 4y - 8 = 0$ is :

(A) 13 (B) $\sqrt{13}$

(C) 3 (D) $\sqrt{3}$

(38) If $y=6x + c$ touches $x^2 + y^2 = 37$ then value of C is :

(A) 37 (B) -37

(C) ± 37 (D) $(37)^2$

(39) How many tangents can be drawn from (0,0) to $x^2 + y^2 = 1$?

(A) 1 (B) 2

(C) 0 (D) 4

(40) If one end of a diameter of the circle $x^2 + y^2 - 4x - 6y + 11 = 0$ is (3,4) then its other end point is :

(A) (-1, 2) (B) (-1, -2)

(C) (2, 1) (D) (1, 2)

(41) Centre of a circle $ax^2 + (2a - 3)y^2 - 4x - 1 = 0$ is :

(A) (2, 0) (B) $\left(\frac{-2}{3}, 0\right)$

(C) (2/3, 0) (D) (-2, 0)

(42) Equation of a circle of which (3, 4) and (4, 3) are the ends of a diameter is

(A) $x^2 + y^2 + 7x + 7y + 24 = 0$ (B) $x^2 + y^2 - 6x - 8y + 25 = 0$

(C) $x^2 + y^2 - 7x - 7y + 24 = 0$ (D) None of these

(43) The equation of a circle touching x-axis and having its centre at (4,-3) is :

(A) $x^2 + y^2 + 8x - 6y + 16 = 0$ (B) $x^2 + y^2 - 8x + 6y + 9 = 0$

(C) $x^2 + y^2 - 8x + 6y + 16 = 0$ (D) $x^2 + y^2 + 8x - 6y + 9 = 0$

(44) If $x^2 + y^2 - ax - 2y + 4 = 0$ touches x-axis, then a is :

(A) 12 (B) 16

(C) ± 4 (D) ± 1

(45) Find f if the circle $x^2 + y^2 + 2x + fy + k = 0$ touches bouth the axes :

(A) $f = 0$ (B) $f = \pm 4$

(C) $f = \pm 2$ (D) $f = \pm 1$

(46) The equation of the circle through the points (0, 0) (2, 0) and (0, 4) is :

(A) $x^2 + y^2 + 2x + 4y = 0$ (B) $x^2 + y^2 - 2x - 4y = 0$

(C) $x^2 + y^2 - 2x = 0$ (D) $x^2 + y^2 - 4y = 0$

(47) If (3, 4) and (-3, -4) are ends of a diameter of a circle then equation of the circle is :

(A) $x^2 + y^2 = 25$ (B) $x^2 + y^2 = 9$

(C) $x^2 + y^2 = 16$ (D) None of these

(48) Intersection set of a line $3x + 4y = 20$ and circle $x^2 + y^2 = 16$ is :

(A) Singleton set (B) Intersecting in two points

(C) Empty set (D) None of these

(49) If (1,0) is a mid point of a chord of circle $x^2 + y^2 - 4x = 0$ then equation of a line containing this chord is :

(A) $y = 2$ (B) $y = 0$

(C) $x = 1$ (D) $y = 1$

(50) Equation of a line containing the common chord of the circles $x^2 + y^2 = 1$ and $x^2 + y^2 - 2x = 0$ on the x-axis is :

(A) $x = 1$ (B) $x = \frac{1}{2}$

(C) $2x + 1 = 0$ (D) $x + 1 = 0$

(51) Length of the chord made by circle $x^2 + y^2 + 10x - 6y + 9 = 0$ on the x-axis is :

(A) 8 (B) 6

(C) 4 (D) 2

(52) Area of the circle passing through (4,6) and centre at (1,2) is :

(A) 5π (B) 25π

(C) 10π (D) 20π

(53) Circle $x^2 + y^2 - 2x + 4y + 4 = 0$ touches at :

(A) X-axis (B) y-axis

(C) both axes (D) None of these

(54) If the line $y = x + a\sqrt{2}$ touches the circle $x^2 + y^2 = a^2$ then its point of contact is :

(A) $\left(\frac{a}{\sqrt{2}}, \frac{-a}{\sqrt{2}}\right)$ (B) $\left(\frac{a}{2}, \frac{a}{-2}\right)$

(C) $\left(\frac{a}{\sqrt{2}}, \frac{a}{\sqrt{2}}\right)$ (D) $\left(\frac{-a}{\sqrt{2}}, \frac{a}{\sqrt{2}}\right)$

(55) If the circles $x^2 + y^2 - 6x - 8y + 9 = 0$ and $x^2 + y^2 = a^2$ touch each other externally then value of a is

(A) 1 (B) -1

(C) 21 (D) 16

(56) Which of the following is a parametric point of a parabola $y^2 = 20x$

(A) $(5t, 4t^2)$ (B) $(5t^2, 4t)$

(C) $(5t^2, 10t)$ (D) does not exist

(57) For which value of c a line $y = 2x + c$ is a tangent to the parabola $y^2 = 16x$?

(A) 2 (B) -2

(C) 8 (D) 4

(58) What is the length of the latus rectum of $x^2 = -8y$

(A) -2 (B) -8

(C) 2 (D) 8

(59) What is the equation of a directrix of $x^2 = -16y$

(A) $x = -4$ (B) $y = -4$

(C) $y = 4$ (D) $x = 4$

(60) If the line $3x - 4y + 5 = 0$ is tangent to the parabola $y^2 = 4ax$ then value of a is :

(A) $\frac{15}{16}$ (B) $\frac{5}{4}$

(C) $-4/3$ (D) $-5/4$

(61) What will be the mid point of a latus rectum of a parabola $y^2 = 32x$

(A) (8, 0) (B) (-8, 0)

(C) (8, 16) (D) (0, 8)

(62) For the parabola $x^2 = 16y$ its focus point co-ordinates are :

(A) (0, 8) (B) (4, 0)

(C) (0, 4) (D) (0, -4)

(63) What willbe the equation of a tangent to the parabola $y^2 = 8x$ at (2,4) ?

(A) $x + y + 2 = 0$ (B) $x - y + 2 = 0$

(C) $x - y - 2 = 0$ (D) $x + y - 2 = 0$

(64) If one end point of a focal chord of the parabola $y^2 = 4x$ is (4,4) then its another end point is :

(A) $\left(\frac{1}{4}, \frac{1}{4}\right)$ (B) $\left(\frac{1}{4}, -1\right)$

(C) $\left(\frac{1}{4}, 1\right)$ (D) $\left(1, \frac{1}{4}\right)$

(65) If the line $y = mx + c$ is a tangent to the parabola $y^2 = 4ax$ then :

(A) $c = am$ (B) $c = \frac{a}{m}$, $m \neq 0$

(C) $c = a/m^2$, $m \neq 0$ (D) $c = m/a$, $a \neq 0$

(66) Which of the following is a equation of a tangent to parabola $y^2 = 12x$ at $t = 2$?

(A) $x - 2y = 12$ (B) $x + 2y + 12 = 0$

(C) $-2y - x + 12 = 0$ (D) $x - 2y + 12 = 0$

(67) If $\left(at_1^2, 2at_1\right)$ and $\left(at_2^2, 2at_2\right)$ are the end points of a focal chord of a parabola $y^2 = 4ax$ then $t_1 \cdot t_2 = ?$

(A) 1 (B) -4

(C) -1 (D) 4

(68) Eccentricity of a parabola is :

(A) $0 < e < 1$ (B) $e > 1$

(C) $e = 1$ (D) $e = 0$

(69) Distance between vertex and directrix of $x^2 = 4by$ is :

(A) b (B) $|y|$

(C) $|b|$ (D) $|x|$

(70) What will be the equation of parabola having its focus (0,4) and equation of a directrix is $y+4=0$?

(A) $y^2 = 16x$ (B) $y^2 = 8x$

(C) $x^2 = 16y$ (D) $x^2 = -16y$

(71) What will be the vertical tangent line equation through (0,3) to the parabola $y^2=4x$?

(A) $y = 0$ (B) $x = 0$

(C) $x = 3$ (D) $y = 3$

(72) What willbe the equation of a tangent at t=0 to the parabola $y^2 = 4ax$?

(A) $y = 0$ (B) $y = -a$

(C) $x = -a$ (D) $x = 0$

(73) Which is the end point of a latus rectum of $x^2 = -12y$

(A) (-6, -3) (B) (-6, 3)

(C) (6, 3) (D) (3, 6)

(74) Distance between two directrices of an ellipse $\frac{x^2}{36} + \frac{y^2}{20} = 1$ is :

(A) 8 (B) 12

(C) 18 (D) 24

(75) Equation of an auxilliary circle of an ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$ is :

(A) $x^2 + y^2 = 25$ (B) $x^2 + y^2 = 7$

(C) $x^2 + y^2 = 16$ (D) $x^2 + y^2 = 9$

(76) What will be the equation of the ellipse if its eccentricity = length of latus rectum = 2/3 :

(A) $25x^2 + 45y^2 = 9$ (B) $25x^2 + 14y^2 = 9$

(C) $25x^2 + 54y^2 = 9$ (D) $25x^2 + 4y^2 = 1$

(77) What would be the measure of an accentric angle of $\frac{x^2}{16} + y^2 = 1$ at (0, –1) ?

(A) $-\frac{\pi}{2}$ (B) $\frac{3\pi}{2}$

(C) $\frac{5\pi}{2}$ (D) $\frac{\pi}{2}$

(78) For any point p on the ellipse $\frac{x^2}{16}+\frac{y^2}{25}=1$ with foci S and S^1 then $SP + S^1P =$ ......

(A) 8 (B) 10

(C) 41 (D) 9

(79) Equation of a director circle of $\frac{x^2}{9}+\frac{y^2}{16}=1$ is :

(A) $x^2 + y^2 = 9$ (B) $x^2 + y^2 = 16$

(C) $x^2 + y^2 = 25$ (D) $x^2 + y^2 = 7$

(80) Eccentricity of an ellipse $9x^2 + 4y^2 = 36$ is

(A) $\sqrt{\frac{5}{3}}$ (B) $\sqrt{\frac{3}{5}}$

(C) $\frac{\sqrt{3}}{5}$ (D) $\frac{\sqrt{5}}{3}$

(81) If a line $y = x + c$ is a tangent to an ellipse $\frac{x^2}{16}+\frac{y^2}{9}=1$ then value of c

(A) ± 4 (B) ± 5

(C) ± 3 (D) $\pm\sqrt{7}$

(82) Let L and L^1 be the feet of the perpendiculars drawn from the foci S and S^1 respectively to the tangent at any point p of the ellipse $\frac{x^2}{25}+\frac{y^2}{16}=1$ then $SL^1 \cdot S^1 L^1 =$ ......

(A) 25 (B) 10

(C) 16 (D) 8

(83) Measure of the angle between the tangents drawn through the point (3,2) to an ellipse $\frac{x^2}{9}+\frac{y^2}{4}=1$ is :

(A) 0 (B) $\frac{\pi}{3}$

(C) $\frac{\pi}{6}$ (D) $\frac{\pi}{2}$

(84) Length of the major axis of an ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is (a>b)

(A) 2a (B) 2b

(C) $\frac{2b^2}{a}$ (D) $\frac{2a^2}{b}$

(85) Let A and A^1 are end points of major axis and S and S^1 are foci of the ellipse $\frac{x^2}{16}+\frac{y^2}{9}=1$ then $AS \cdot A^1S$: ?

(A) 16 (B) 9

(C) 8 (D) 6

(86) Equation of an auxilliary circle of $\frac{x^2}{4}-\frac{y^2}{9}=1$ is :

(A) $x^2+y^2=-5$ (B) $x^2+y^2=4$

(C) $x^2+y^2=9$ (D) $x^2+y^2=5$

(87) What will be the eccentricity of a hyper bola $x^2-y^2=16$?

(A) $\sqrt{2}$ (B) 2

(C) 4 (D) 1

(88) Measure of the angle between two asymptotes of the hyperbola $x^2-y^2=1$ is :

(A) $\frac{\pi}{2}$ (B) $\frac{\pi}{4}$

(C) $\frac{\pi}{3}$ (D) $\frac{-\pi}{2}$

(89) Parametric equations of a director circle : $\frac{x^2}{9}-\frac{y^2}{5}=1$ is :

(A) $(2\cos\theta, 2\sin\theta)$ (B) $(3\cos\theta, 5\sin\theta)$

(C) $(3\cos\theta, \sqrt{5}\sin\theta)$ (D) $(\sqrt{3}\cos\theta, 5\sin\theta)$

(90) Focus point co-ordinates of a hyperbola $y^2-x^2=5$ is :

(A) $(\pm\sqrt{10}, 0)$ (B) $(0, \pm\sqrt{10})$

(C) $\left(\pm\frac{\sqrt{5}}{2}, 0\right)$ (D) $\left(0, \pm\frac{\sqrt{5}}{2}\right)$

(91) Length of the conjugate axis of the hyperbola $16x^2-9y^2=-144$ is :

(A) 4 (B) 6

(C) 8 (D) 16

(92) Equation of asymptotes of the hyperbola : $\frac{x^2}{64}-\frac{y^2}{16}=1$ is :

(A) $y=\pm\frac{x}{2}$ (B) $x=\pm\frac{y}{2}$

(C) $x=y$ (D) $x=-y$

(93) Equation of a tangent parallel to $y=x$ to $\frac{x^2}{3}-\frac{y^2}{2}=1$ is :

(A) $x - y + 1 = 0$ (B) $x - y + 2 = 0$

(C) $x - y - 1 = 0$ (D) $x - y + 2 = 0$

(94) Point of contact of a tangent line $3x - 4y = 5$ to the hyperbola $x^2 - 4y^2 = 5$ is :

(A) (-3, -1) (B) (-3, 1)

(C) (3, 1) (D) (3, -1)

(95) $\bar{x}=(1,1,2)$, $\bar{y}=(1,2,1)$, $\bar{z}=(2,1,1)$ then $\bar{x}\times(\bar{y}\times\bar{z})=$ ....

(A) (-5, 5, 0) (B) (5,-5, 0)

(C) (-1, 1, 0) (D) (1, -1, 0)

(96) If $\bar{a}=(1,-1,1)$ and $\bar{b}=(1,2,1)$ then $(\bar{a}\wedge\bar{b})=$ ....

(A) $\cos^{-1}\left(\frac{1}{\sqrt{5}}\right)$ (B) $\cos^{-1}\left(\frac{4}{\sqrt{15}}\right)$

(C) $\frac{\pi}{2}$ (D) $\cos^{-1}\left(\frac{4}{15}\right)$

(97) Direction cosines of $2\bar{i}+2\bar{j}-\bar{k}$ is :

(A) $\frac{2}{3},\frac{2}{3},\frac{-1}{3}$ (B) $\frac{2}{3},\frac{2}{3},\frac{1}{3}$

(C) $\frac{-2}{3},\frac{-2}{3},\frac{1}{3}$ (D) $\frac{-2}{3},\frac{2}{3},\frac{1}{3}$

(98) Magnitude of a projection vector of $\bar{i}+\bar{k}$ on $\bar{i}+\bar{j}$ is ....

(A) $\frac{1}{2}$ (B) $\frac{1}{\sqrt{2}}$

(C) $\sqrt{2}$ (D) 1

(99) If $\bar{x}=(1,2,-1)$ and $\bar{y}=(3,2,1)$ then $\bar{x}\cdot\bar{y}=$ ....

(A) 6 (B) -6

(C) 8 (D) 12

(100) For ΔABC and $\vec{AB}=\bar{i}+2\bar{j}+3\bar{k}$ and $\vec{AC}=-3\bar{i}+2\bar{j}+\bar{k}$ then area ΔABC is :

(A) 45 (B) $5\sqrt{3}$

(C) $3\sqrt{5}$ (D) $\frac{3}{2}\sqrt{5}$

(101) A $(-1,2,0)$, B $(1,2,3)$ and c $(4,2,1)$ then ΔABC is :

(A) Equilateral (B) Right angled

(C) Isosceles (D) Isosceles right angled

(102) If $|\bar{x}| = |\bar{y}| = 1$ and $(\bar{x} \wedge \bar{y}) = \theta$ then $|\bar{x} - \bar{y}| = \ldots\ldots$

(A) $2\cos\frac{\theta}{2}$ (B) $\sin\theta$

(C) $2\cos\theta$ (D) $2\sin\frac{\theta}{2}$

(103) A unit vector making angles of equal measure with $\bar{i}, \bar{j}, \bar{k}$ is :

(A) $\left(\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, \frac{-1}{\sqrt{3}}\right)$ (B) $\left(\frac{1}{\sqrt{3}}, \frac{-1}{\sqrt{3}}, \frac{1}{\sqrt{3}}\right)$

(C) $\left(\frac{-1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}\right)$ (D) $\left(\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}\right)$

(104) What is λ if $(5, 2, -1)$ and $(\lambda, -1, 5)$ are orthogonal

(A) $\frac{5}{7}$ (B) $\frac{-7}{5}$

(C) $\frac{7}{5}$ (D) $-\frac{5}{7}$

(105) If $|\bar{x}| = |\bar{y}| = 1$ and $\bar{x} \perp \bar{y}$ then $|\bar{x} + \bar{y}| = \ldots\ldots?$

(A) 2 (B) 1

(C) 0 (D) $\sqrt{2}$

(106) If the displacement of a particle is $3\bar{i} + 2\bar{j} - 5\bar{k}$ due to the force $2\bar{i} - \bar{j} - \bar{k}$ find the work done :

(A) -9 (B) 8

(C) -8 (D) 9

(107) If $\bar{a} = (1,2,-1)$ and $\bar{b} = (2,2,1)$ then $\text{Proj}_{\bar{a}}\, \bar{b} = \ldots\ldots\ldots\ldots\ldots$

(A) $\frac{7}{3}$ (B) $\frac{7}{6}\bar{a}$

(C) $\frac{7}{9}\bar{b}$ (D) $\frac{7}{3}\bar{a}$

(108) If $\bar{a} = 3\bar{i} + 4\bar{j} + \bar{k}$ and $\bar{b} = \bar{i} + \bar{j} - \bar{k}$ then $\text{comp}_{\bar{b}}\bar{a} = \ldots\ldots\ldots\ldots\ldots$

(A) (2, 2, -2) (B) (2, -2, 2)

(C) (-2, 2, 2) (D) $2\sqrt{3}$

(109) Measure of angle between $\frac{x}{2}=\frac{y}{2}=\frac{z}{1}$ and $\frac{x}{2}=\frac{y}{-1}=\frac{z}{-2}$ is :

(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{4}$

(C) $\frac{\pi}{3}$ (D) $\frac{\pi}{2}$

(110) Equation of the plane whose intercepts on the axes are 3, 2, 6 is :

(A) $2x+3y+z-6=0$ (B) $\frac{x}{3}+\frac{y}{2}+\frac{z}{6}=6$

(C) $2x+3y+z=0$ (D) $\frac{x}{3}+\frac{y}{2}+\frac{z}{6}=0$

(111) Direction ratios of $\frac{3-x}{1}=\frac{y-2}{5}=\frac{2z-3}{1}$ are :

(A) (1, 5, -1) (B) (-1, 5, 1/2)

(C) (1, 5, 2) (D) (-1, 5, -2)

(112) If $\frac{x-1}{c}=\frac{y+2}{-2}=\frac{z-3}{4}$ and $\frac{x-5}{1}=\frac{y-3}{1}=\frac{z+1}{c}$ have same directions, then c = ?

(A) -2 (B) 2

(C) 4 (D) -4

(113) Measure of angle between two lines having their directions $\bar{l}=(-1,2,3)$ and $\bar{m}=(6,2,3)$ is ....

(A) $\sin^{-1}(\sqrt{14})$ (B) $\sin^{-1}\left(\frac{1}{\sqrt{14}}\right)$

(C) $\cos^{-1}\left(\frac{1}{\sqrt{14}}\right)$ (D) $\cos^{-1}(\sqrt{14})$

(114) Distance between planes $2x+2y+z+3=0$ and $2x+2y+z-15=0$ is :

(A) 1/6 (B) 4

(C) 2 (D) 6

(115) For A (a, 3), B (5, -1), c (4, -2) and D (-1, 1) if $\overrightarrow{AB} \parallel \overrightarrow{CD}$ then value of a is :

(A) $\frac{3}{5}$ (B) $\frac{-5}{3}$

(C) $\frac{5}{3}$ (D) $\frac{-3}{5}$

(116) Measure of Angle between the plane 2x + 2y + z + 1 = 0 and $\frac{x-1}{-2}=\frac{y-1}{2}=\frac{z-1}{1}$ is :

(A) $\cos^{-1}\left(\frac{1}{9}\right)$ (B) $\sin^{-1}\left(\frac{1}{9}\right)$

(C) $\cos^{-1}\left(\frac{1}{3}\right)$ (D) $\sin^{-1}\left(\frac{1}{3}\right)$

(117) $\frac{x-1}{1}=\frac{y-1}{2}=\frac{z-2}{3}$ and $\frac{x-1}{2}=\frac{y-2}{2}=\frac{z-3}{-2}$ lines are :

(A) parallel (B) mutually perpendicular

(C) intersecting at an acute angle (D) skew lines

(118) What will be the volume of the parallelopiped three of whose edges are ;

$\vec{OA}=(2,1,1)$, $\vec{OB}=(3,-1,1)$, $\vec{OC}=(-1,1,-1)$?

(A) -4 (B) 4

(C) 2 (D) None of these

(119) Direction of line of intersection of : $\bar{r}\cdot(1,0,1)=2$ and $\bar{r}\cdot(0,1,1)=3$

(A) (-1, 1, 1) (B) (-1, -1, -1)

(C) (-1, -1, 1) (D) (1, -1, 1)

(120) Radius of a $|\bar{r}|^2-\bar{r}\cdot(6,12,14)+13=0$ is :

(A) $\sqrt{30}$ (B) $\sqrt{94}$

(C) 5 (D) 9

(121) What will be the perpendicular distance of P (5,4,3) from the line $\frac{x-1}{2}=\frac{y-2}{1}=\frac{z+1}{2}$?

(A) 0 (B) 3

(C) $2\sqrt{10}$ (D) $\sqrt{6}$

(122) Measure of angle between the planes y=0 and z=0 is :

(A) $\frac{\pi}{4}$ (B) $\frac{\pi}{2}$

(C) $\frac{\pi}{6}$ (D) $\frac{\pi}{3}$

(123) X-intercepts of a sphere $x^2+y^2+z^2-2x-2y-2z=0$ is :

(A) 1 (B) -2

(C) 2 (D) $\sqrt{3}$

(124) What is the cartesian equation of a sphere having its radius 3 and touching xy- plane at (1,2,0) ?

(A) $x^2 + y^2 + z^2 - 2x - 4y - 4 = 0$

(B) $x^2 + y^2 + z^2 - 2x - 4y + 4 = 0$

(C) $x^2 + y^2 + z^2 - 2x - 4y - 6z + 5 = 0$

(D) $x^2 + y^2 + z^2 + 2x + 4y - 4 = 0$

(125) $\lim_{x \to \pi/2} \frac{\cot x}{\left(\pi/2 - x\right)} = \ldots\ldots$

(A) 0 (B) 1

(C) -1 (D) 2

(126) $\lim_{x \to \pi} \frac{1 + \cos^3 x}{(x - \pi)^2} = \ldots\ldots$

(A) $\frac{1}{3}$ (B) $\frac{1}{2}$

(C) $\frac{3}{2}$ (D) 4

(127) If $5x \le f(x) \le 2x^2 + 3$, $\forall\ x \in R$ then $\lim_{x \to 1} f(x) = \ldots\ldots\ldots\ldots$

(A) 5 (B) -5

(C) 2 (D) 3

(128) $\lim_{x \to 0} \frac{a^x + b^x - 2}{x} = \ldots\ldots \left(a, b \in R^+\right)$

(A) $\log\left(\frac{a}{b}\right)$ (B) $\log_e(ab)$

(C) $(\log a)(\log b)$ (D) 1

(129) N (a, δ) = (3, 7) then a = ... $(\delta > 0)$

(A) 2 (B) 3

(C) 5 (D) 1

(130) $\lim_{x \to 2} \frac{x^n - 2^n}{x - 2} = 80$, $n \in N$ then $n = \ldots\ldots$

(A) 3 (B) 4

(C) 5 (D) 2

(131) $\lim_{x\to -1} \dfrac{x^{15}+1}{x^{17}+1} = \ldots\ldots$

(A) $\dfrac{15}{17}$ (B) $\dfrac{-15}{17}$

(C) $\dfrac{17}{15}$ (D) $\dfrac{-17}{15}$

(132) $\lim_{x\to 0} \dfrac{2^{x+5}-32}{x} = \ldots\ldots$

(A) $\log_e 2$ (B) 32

(C) $32\log_e 2$ (D) $\log_2 e$

(133) $\dfrac{d}{dx}\left(e^{-\log_e x}\right) = \ldots\ldots$

(A) -x (B) $\dfrac{1}{x}$

(C) $-\dfrac{1}{x}$ (D) $-\dfrac{1}{x^2}$

(134) N* (a, δ) - N (a, δ) = ...

(A) ϕ (B) $\{\phi\}$

(C) {a} (D) a

(135) If $N(4,\delta) \cap N(14,\delta) = \phi$ then δ

(A) 4 (B) 10

(C) 14 (D) 5

(136) $\lim_{n\to\infty} \left(\dfrac{n^2+n-2}{n^2-1}\right)^{n+1} = \ldots\ldots$

(A) 0 (B) e^{-1}

(C) e (D) e^2

(137) $\lim_{x\to\infty} x\left(\sqrt[x]{3}-1\right) = \ldots.$

(A) $\log_e 3$ (B) $\log_3 e$

(C) 0 (D) Does not exist

(138) $\lim_{x\to 1} x^{\frac{1}{x-1}} = \ldots\ldots$

(A) e (B) o

(C) 1 (D) ∞

(139) $\lim_{x\to 0} \frac{f(\cos x)}{x^2} =$ .... where $f(x)=\frac{1-x}{1+x}$

(A) $\frac{1}{2}$ (B) $\frac{1}{4}$

(C) $\frac{1}{5}$ (D) $\frac{1}{3}$

(140) $\left\{x / \frac{1}{|3x+2|} \le \frac{1}{5}\ ,\ x \in R-\left\{-\frac{2}{3}\right\}\right\}$ then its complements is : ....

(A) $R-\left(1,\frac{7}{3}\right)$ (B) $\left(1, \frac{7}{3}\right)$

(C) $\left(-\frac{7}{3},1\right)$ (D) $R-\left(\frac{-7}{3},1\right)$

(141) $\lim_{x\to -1} \frac{x^{1998}-1}{x^n+1} = -\frac{1998}{1997}$ તો $n=$ .... where $n \ne 2m,\ n \in N$

(A) 1997 (B) - 1997

(C) 1998 (D) - 1998

(142) $\lim_{x\to\infty} \left(\frac{2x+1}{2x-1}\right)^x = \ldots\ldots$

(A) $e^{-\frac{1}{2}}$ (B) 1

(C) $e^{\frac{1}{2}}$ (D) e

(143) $\lim_{x\to 0^-} \frac{1}{3+2^{1/x}} = \ldots\ldots$

(A) $\frac{1}{3}$ (B) $\frac{1}{2}$

(C) 0 (D) $\frac{-1}{3}$

(144) $\lim_{x\to\infty} \left(1-\frac{3}{x+1}\right)^x = \ldots\ldots$

(A) e (B) e^3

(C) e^{-3} (D) Does not exist

(145) $0<|x+3|<\delta, x \in R \Rightarrow f(x)=(2x-1) \in N(-7,2)$ then maximum value of $\delta =$ ......

(A) 0005 (B) 0.1

(C) 0.2 (D) 0.3

(146) $\lim_{x\to 0^-} \dfrac{x}{(2x-|x|)} =$ ......

(A) 1 (B) 1/3

(C) -1 (D) 3

(147) $\lim_{x\to 1} \dfrac{e^x-e}{x-1} =$ ......

(A) e (B) 1

(C) $\dfrac{1}{e}$ (D) 0

(148) $\lim_{x\to 0} \dfrac{(1+x)^{\frac{1}{5}}-1}{x} =$ ......

(A) $\dfrac{1}{5}$ (B) 5

(C) $\dfrac{-1}{5}$ (D) 1

(149) $\lim_{x\to 0} (1-3x)^{\frac{1}{x}} =$ ......

(A) e^3 (B) e^{-3}

(C) e (D) 1

(150) $f(x)=3^x$ તો $f'(0) =$ ......

(A) 1 (B) 3

(C) $\log_e 3$ (D) 0

(151) $\lim_{x\to 0} \dfrac{1-\cos\left(\dfrac{x}{2}\right)}{x^2} =$ ......

(A) $\dfrac{1}{2}$ (B) $\dfrac{1}{4}$

(C) $\dfrac{1}{8}$ (D) 8

(152) $\lim_{x\to 0} \frac{2}{x}\log(1+x) = ...$

(A) e^2 (B) e

(C) 2 (D) $\frac{1}{2}$

(153) $\lim_{x\to 0_-} \frac{\sin x}{|x|} = ...$

(A) 1 (B) 0

(C) -1 (D)

(154) $\lim_{n\to\infty} r^n = 0$ then ......

(A) $0<|r|<1$ (B) $|r|>1$

(C) $|r|=1$ (D) $r=0$

(155) $\lim_{x\to e} \left(\frac{x}{e}\right)^{\frac{1}{x-e}} = ...$

(A) $\frac{1}{e}$ (B) $e^{\frac{1}{e}}$

(C) $e^{-\frac{1}{e}}$ (D) e^e

(156) $\lim_{x\to 0} \frac{e^{3\sin x}-1}{\tan x} = ...$

(A) 0 (B) 3

(C) $\log_e 3$ (D) Not possible

(157) $\frac{d}{dx}\left[\sin^{-1}\frac{x}{\sqrt{1+x^2}} + \cot^{-1}x\right] = ...$

(A) $\frac{x}{\sqrt{1+x^2}}$ (B) $\frac{1}{1+x^2}$

(C) 0 (D) $\frac{2}{1+x^2}$

(158) $y = \sin^{-1}\left(\frac{x}{a}\right)$; $a<0 \Rightarrow \frac{dy}{dx} = ...$

(A) $\frac{1}{\sqrt{a^2-x^2}}$ (B) $\frac{-1}{\sqrt{a^2-x^2}}$

(C) $\frac{1}{\sqrt{x^2-a^2}}$ (D) $\cos^{-1}\left(\frac{x}{a}\right)$

(159) $\frac{d}{dx}\left(x^x\right) = \ldots\ldots$

(A) $x \cdot x^{x-1}$ (B) $x^x\left(1+\log x\right)$

(C) x^x (D) $x^x \cdot \log_e x$

(160) $\frac{d}{dx}\left(\frac{1}{V}\right) = \ldots\ldots$

(A) $\frac{1}{V^2}$ (B) $\frac{-1}{V^2}$

(C) $\frac{-1}{V^2}\cdot\frac{dv}{dx}$ (D) $v^2 \cdot \frac{dv}{dx}$

(161) $\frac{d}{dx}\left[e^{-4\log(1+x)}\right] = \ldots\ldots$

(A) $\frac{4}{(1+x)^5}$ (B) $\frac{-4}{(1+x)^5}$

(C) $\frac{5}{(1+x)^4}$ (D) -4

(162) $x = \cos^3 t, y = \sin^3 t$ then $\frac{dy}{dx} = \ldots\ldots$

(A) tant (B) - tant

(C) $\tan^2 t$ (D) sect

(163) Derivative of $\sin^{-1}x$ w.r.t. $\cos^{-1}x$ is :

(A) 1 (B) -1

(C) 0 (D) 2

(164) $x^2 - y^2 = 1$ then $\frac{d^2y}{dx^2} = \ldots\ldots$

(A) $\frac{1}{y^3}$ (B) $\frac{1}{y^2}$

(C) $\frac{-1}{y^2}$ (D) $-\frac{1}{y^3}$

(165) $\frac{d}{dx}\left(4\cos^3 x - 3\cos x\right) = \ldots\ldots$

(A) 3 sin 3x (B) -3 sin 3x

(C) $\frac{\sin 3x}{3}$ (D) $\frac{-\sin 3x}{3}$

(166) $\frac{d}{dx}\left(e^{\log_e(\sin x)}\right) = \ldots\ldots$

(A) $\sin x$ (B) $\cos x$

(C) $-\cos x$ (D) $e^{\log_e(\sin x)}$

(167) $\frac{d}{dx}\left(\cos^2 2x\right) = \ldots\ldots$

(A) $-2\sin 2x$ (B) $-2\sin 4x$

(C) $-\sin^2(2x)$ (D) $-\cos 4x$

(168) $y = \log_{10}(x^2+1) = \ldots\ldots$

(A) $\log_{10} 2x$ (B) $\frac{2x}{x^2+1}$

(C) $\frac{2x}{\log_e 10 \cdot (x^2+1)}$ (D) $\frac{1}{x^2+1}$

(169) Rate of changes in a volume of a sphere w.r.t. its diameter is (Volume = V Diameter = y)

(A) $\frac{1}{2}\pi y^2$ (B) $4\pi y^2$

(C) $\frac{1}{4}\pi y^2$ (D) $\frac{4}{3}\pi y^3$

(170) If there is 5 % error in measuring the radius of sphere then what will be the percentage error in the volume of the sphere ?

(A) 15% (B) 10%

(C) 25% (D) 30%

(171) Radius of a circular metal plate when heated, increased by 2 %, Find then increases in its area, given that its initial radius is 10 cm.

(A) 2π $(Cm)^2$ (B) 4π $(m)^2$

(C) 4π $(Cm)^2$ (D) 2π $(m)^2$

(172) At what point of the curve $y = x^2 - 4x + 5$, slope of the tangent is 2 ?

(A) (3, 2) (B) (-3, 2)

(C) (2, 3) (D) (-2, 3)

(173) Approximate value of $\sin^{-1}(0.49) = \ldots\ldots\ldots\ldots$

(A) $\frac{\pi}{3} - \frac{1}{50\sqrt{3}}$ (B) $\frac{\pi}{6} - \frac{1}{50\sqrt{3}}$

(C) $\frac{\pi}{6} + \frac{1}{50\sqrt{3}}$ (D) $\frac{\pi}{3} - \frac{1}{5\sqrt{3}}$

(174) What will be the length of subtangent to a curve $y = f(x)$ at point p (x, y) on the curve ?

(A) $\left| y \cdot \frac{dy}{dx} \right|$ (B) $|y|$

(C) $\left| \frac{y}{dy/dx} \right|$ (D) $\frac{y}{dy/dx}$

(175) If $x = t^3 - 9t^2 + 3t + 1$ and $v = -24$ m/sec. then a is ....

(A) 1 (B) 2

(C) 3 (D) 0

(176) Order and degree of a differential equation $\frac{d^2y}{dx^2} + 3y = 0$ is :

(A) 2, 2 (B) 1, 2

(C) 2, 1 (D) Not possible

(177) $\int 2^{3x}\, dx = \ldots\ldots + c$

(A) $\frac{2^{3x}}{\log_e 2}$ (B) $3 \cdot \frac{2x}{\log_e 2}$

(C) $\frac{2^{3x}}{3 \cdot \log_e 2}$ (D) $2^{3x} \cdot 3\log_e 2$

(178) $\int \log x \cdot dx = \ldots\ldots + c$

(A) $x\log x - x$ (B) $x.(1 + \log x)$

(C) $\log x + 1$ (D) e^x

(179) $\int \left[\frac{1}{\log x} - \frac{1}{(\log x)^2} \right] dx = \ldots\ldots + c$

(A) $x\log x$ (B) $x - (\log x)^2$

(C) $\frac{x}{\log x}$ (D) $\frac{x}{(\log x)^2}$

(180) $\int \left(\sin^{-1} x + \cos^{-1} x\right) dx = \ldots\ldots + c$

(A) $\frac{1}{2}\pi x$ (B) $x\left(\sin^{-1} x - \cos^{-1} x\right)$

(C) $\frac{-1}{2}\pi x$ (D) $x\left(\cos^{-1} x - \sin^{-1} x\right)$

(181) $\int \frac{x^4+x^2+1}{x^2+1}\,dx = \text{......}$

(A) $\frac{x^5}{5}+c$ (B) $\frac{x^3}{3}+\tan^{-1}x+c$

(C) $\frac{x^3}{3}+x+c$ (D) $x^3+\tan^{-1}x+c$

(182) $\int e^x(1+\tan x)\sec x\cdot dx = \text{......}$

(A) $e^x\cdot\sec x+c$ (B) $e^x\cdot\tan x+c$

(C) $e^x\cdot\cot x+c$ (D) $e^x\cdot\cos x+c$

(183) $\int\left[\log x+\frac{1}{x}\right]e^x\cdot dx = \text{......}+c$

(A) $\frac{e^x}{\log x}$ (B) $\frac{\log x}{e^x}$

(C) $\frac{(\log x)^2}{2}$ (D) $e^x\cdot\log x$

(184) $\int \frac{x^{e-1}-e^{x-1}}{x^e-e^x}\,dx = \text{..........}+c$

(A) $e\cdot\log\left(x^e-e^x\right)$ (B) $\frac{1}{e}\log\left(x^e-e^x\right)$

(C) $\log\left(x^e-e^x\right)$ (D) $-\log\left(x^e-e^x\right)$

(185) $\int \frac{1}{1+\sin x}\,dx = \text{......}+c$

(A) $\tan\left(\frac{\pi}{4}-\frac{x}{2}\right)$ (B) $\frac{-1}{2}\tan\left(\frac{\pi}{4}-x\right)$

(C) $-\tan\left(\frac{\pi}{4}-\frac{x}{2}\right)$ (D) $-2\tan\left(\pi/4+x\right)$

(186) $\int \frac{e^{2x}-1}{e^{2x}+1}\,dx = \text{......}$

(A) $\log\left|e^{2x}+1\right|$ (B) $\log\left|e^x+e^{-x}\right|$

(C) $\log\left|e^x-e^{-x}\right|$ (D) $\frac{1}{e}\log\left|e^x+e^{-x}\right|$

(187) $\int \frac{(\log x)^{-1}}{x} dx$ = ... + c (x > 0)

(A) 0 (B) $-\frac{(\log x)^{-2}}{2}$

(C) $\log|\log x|$ (D) $\log\left|\frac{1}{x}\right|$

(188) $\int \frac{f^1(x)}{\sqrt{f(x)}} dx$ = ... + c

(A) $2\sqrt{f(x)}$ (B) $2f(x)$

(C) $\frac{1}{2}\sqrt{f(x)}$ (D) $\frac{1}{2}f(x)$

(189) $\int \frac{1}{\sqrt{1-x}} dx$ = ... + c

(A) $\sin^{-1}(\sqrt{x})$ (B) $-\sin^{-1}(\sqrt{x})$

(C) $-2\sqrt{1-x}$ (D) $2\sqrt{1-x}$

(190) $\int \frac{dx}{x\cdot(\log x)^3}$ = ...+ c

(A) $\frac{1}{(\log x)^2}$ (B) $\frac{-1}{2(\log x)^2}$

(C) $-(\log x)^2$ (D) $\frac{3}{(\log x)^4}$

(191) $\int \frac{(1-x)e^x}{x^2} dx$ = ...

(A) $\frac{-e^x}{x}+c$ (B) $\frac{e^x}{x^2}+c$

(C) $\frac{e^x}{x}+c$ (D) $\frac{-e^x}{x^2}+c$

(192) $\int x^{4x}(1+\log x)\,dx$ = ... + c

(A) $\frac{x^x}{4}$ (B) $\frac{x^{4x}}{4}$

(C) $\frac{x^{3x}}{3}$ (D) $\frac{x^x}{3}$

(193) $\int \frac{1}{x\sqrt{1+\log_e x}} dx = ...$

(A) $\frac{1}{x\sqrt{1+\log_e x}} + c$ (B) $\frac{1}{\sqrt{1+\log_e x}} + c$

(C) 1 (D) $2\sqrt{1+\log_e x} + c$

(194) If $\int_0^k \frac{1}{2+8x^2} dx = \frac{\pi}{16}$ then $k = ...$

(A) $\frac{-1}{2}$ (B) $\frac{1}{2}$

(C) 0 (D) Not possible

(195) $\int_{-1}^{2} |x| dx = ...$

(A) $\frac{5}{2}$ (B) 2

(C) $\frac{3}{2}$ (D) 1

(196) $\int \left(\sin\frac{x}{2} + \cos\frac{x}{2}\right)^2 dx = ... + c$

(A) $x - \cos x$ (B) $x + \operatorname{Sin}x$

(C) $x + \cos x$ (D) 1 - cosx

(197) $\int_{\log_e 3}^{\log_e 7} e^x \cdot dx = ...$

(A) -1 (B) 1

(C) 0 (D) 4

(198) $\int_{-1}^{1} \frac{x^3}{a^2 - x^2} dx = ...$ $(a > 1)$

(A) 0 (B) 1

(C) -1 (D) -4

(199) $\int_{-\pi/2}^{\pi/2} \sin^3 x \cdot \cos^2 x \; dx = ...$

(A) 0 (B) 1

(C) -1 (D) 2

(200) Water comes out of a water pipe at 20 m/s. The pipe is at angle of measure $\pi/4$ with the ground. What will be distance covered on the ground by the water ?

(A) 40.8 m (B) 408 cm

(C) 40.8 m/s (D) 408 meter

(201) What will be the area of the region bounded by the curve $y = \cos x$, x-axis and the lines $x=0$ and $x = \pi/2$

(A) 3 (B) 2

(C) 1 (D) 4

(202) ath of the projectile is :

(A) circle (B) line

(C) parabola (D) Ellipse

(203) If for a projectile R = maximum horizontal range then maximum height is :

(A) $\frac{R}{2}$ (B) $\frac{R}{3}$

(C) $\frac{R}{5}$ (D) 2R

(204) Degree of a $\frac{dy}{dx} + \sin\left(\frac{y}{x}\right) = 0$ is :

(A) 1 (B) 0

(C) -1 (D) Not possible

(205) A body projected in vertical direction attains maximum height 50 m. then its velocity at 25 m height is :

(A) $7\sqrt{10}$ (B) 490

(C) 480 (D) $10\sqrt{7}$

(206) A particle moves on a line and its distance from a fixed point at time t is x where $x = 4t^2 + 2t$ Find accleration at t=1

(A) 4 (B) 2

(C) 6 (D) 8

(207) What is the length of subtangent at any point on the curve $y = e^{3x}$?

(A) e^{3x} (B) e^3

(C) $\frac{1}{3}$ (D) Not possible

(208) Area of the region enclosed by $y = 4x$ and $y = 4x^2$ is :

(A) 4 (B) 8

(C) $\frac{2}{3}$ (D) $\frac{3}{2}$

(209) What is the measure of angle between $y = \frac{1}{x^2}$ and $y = x^3$ at their inter section point (1,1) ?

(A) $\frac{\pi}{6}$ (B) 0

(C) $\frac{\pi}{4}$ (D) $\frac{\pi}{3}$

(210) What time will be taken by ball for max. height while it is projected vertically upwards with speed 19.6 m/s

(A) 2 Sec. (B) 3 Sec.

(C) 4 Sec. (D) 1 Sec.

(211) General solution of $\frac{dy}{dx} + \frac{x}{y} = 0$ is :

(A) $x + y = c$ (B) $x - y = c$

(C) $x^2 + y^2 = c$ (D) $x^2 - y^2 = c$

(212) If the particle projected vertically upwards with a initial velocity u from the earth then after t=0 particle returns to originalposition at time :

(A) $\frac{u^2}{2g}$ (B) $\frac{2g}{u}$

(C) $\frac{2u}{g}$ (D) $\frac{u}{g}$

(213) Order of a differential equation : $\left(\frac{d^2y}{dx^2}\right)^{\frac{2}{3}} = \left(y + \frac{dy}{dx}\right)^{\frac{1}{2}}$

(A) 4 (B) 3

(C) 2 (D) 1

(214) Ranbge of a projectile is $4\sqrt{3}$ times its maximum height. Find radian measure of angle of projection

(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{3}$

(C) $\frac{\pi}{4}$ (D) $\frac{\pi}{2}$

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Section-B

(1) In which ratio does the x-axis divide the line-segment joining A (3, 5) and B (2,7) from A's side ?

(2) To which point should the origin be shifted so that the new co-ordinates of (7,2) would be (-1,3)?

(3) Using distance formula show that (-1,4), (2,3) and (8,1) are collinear.

(4) Find a if the points concelled (2, 3), (4, 5) and (a,2) form a right angled triangle.

(5) Find the point on the y-axis equidistant from the points (-5,-2) and (3,2)

(6) If the area of the triangle with vertices (a,5) (6,7) and (2,3) is 10, find a.

(7) Find the co-ordinates of circumcentre and incentre of the triangle with vertices (3,4) (0,4) (3,0)

(8) For which value of a, (0, 0), (0, 2) and (a, 0) are vertices of an equilateral triangle ?

(9) For which value of a, (a,2) (2,4), (3,4) are the vertices of a triangle with its area is 1 ?

(10) Pointp (-4,1) divides $\overline{AB}$ from A's side in a ratio 3:4 If A (2,-5) the find the co-ordinates of B.

(11) If a + b = ab then prove that (a,0), (0,b) (1,1) are collinear points.

(12) If (2, 2) and (1, 5) are trisection points of $\overline{AB}$ then find A and B

(13) Two of the vertices of ΔABC are A (3,-5) and B (-7,4) and its cetroid is (2,-1) Find the third vertex C of the triarangle.

(14) If A (2,4), B(4,-2), C (1,3) are three vertices of $\square^m$ABCD then find the co-ordinates of D.

(15) Find the co-ordinates of the points on $\overline{AB}$ which divides it into n congruent parts if A is (0,0) and B is (a,b).

(16) Find the area of the triangle formed by the lines y = x, y = 2x and y = 3x + 4

(17) For A (2, 5) and B (4, 7) prove that (6, 9) $\in \overleftrightarrow{AB}$ but (6,9) $\notin \overline{AB}$

(18) If the ratio of the X-intercept and the y-intercept of a line is 3:2 and if the line passes through A(1,2) find the equation of the line.

(19) Obtain the parametric equations of a line through A (3, -1) and B (0, 3)

(20) Obtain the measure of the angle between the lines x = 3 and $\sqrt{3}x + y - 4 = 0$

(21) Find the perpendicular distance between the lines 3x -4y + 9 = 0 and 6x - 8y - 15 = 0

(22) Obtain the cartesian equation of a line $\{(2\text{-}4t, 7\text{-}12t) / t \in R\}$

(23) Find the perpendicular distance of (2, 1) from the line 12x +5y - 2 = 0

(24) Find K if the lines 5x + ky = 3 and 2x + 3y = 4 are mutually perpendicular.

(25) Find the foot of the perpendicular from the origin to the line $x \cos\alpha + y \sin\alpha = P$

(26) Express the line x + y + 1 = 0 in a $\rho - \alpha$ form, hence obtain α

(27) If (2, 3) is a mid point of a intercept made by line with axes then obtain the equation of such line.

(28) Obtain the equation of a line through (-5, 3) and perpendicular to y = 0

(29) Obtain the equation of a line with aslope -2 and cutting x-axis at a distance 3 unit from the origin.

(30) What will be the slope of the line while its makes an angle of measure 30^0 with y-axis ?

(31) Find the equation of lines at a distance 5 from (2,3) which are parallel to y-axis.

(32) Obtain the value of a lines $ax - 2y + 7 = 0$ and $8x - ay + 1 = 0$ to be mutually parallel lines.

(33) If the slope of line through (K,7) and (2,-5) is $\frac{2}{3}$ then find K.

(34) If A (3, 2), B (6, 5) and p (x, y) $\in \overline{AB}$ then find the maximum and minimum value of 2x-3y

(35) If a and b are the intercepts on the axes of the line $x\cos\alpha + y\sin\alpha = \rho$ then prove that $a^{-2} + b^{-2} = p^{-2}$.

(36) If the lines $ax - 2y - 1 = 0$ and $6x - 4y + b = 0$ are coincident then find a and b.

(37) Determine the location of P(3,-2) relative to the circle $x^2 + y^2 - 5x - 3y - 1 = 0$

(38) Find the length of the tengent from (-2, 3) to the circle $2x^2 + 2y^2 = 3$

(39) Get the equation of the tangent to the circle $x^2 + y^2 = 20$ drawn fromt the point (4,2)

(40) Obtain the equation of the circle of which (3, 4) (2, -7) are the ends of a diameter.

(41) Obtain the equation of the circle with centre (2, −1) and passing through the point (3, 6)

(42) If $y = 2x + c$ is a tangent to the circle $x^2 + y^2 = 5$ Find C.

(43) Get the equation of the tangent to the circle $x^2 + y^2 = 17$ at the point (4, 1)

(44) Obtain the parametric equations of a circle $x^2 + y^2 = 4$

(45) Prove that the centre of the circles $x^2 + y^2 = 1$, $x^2 + y^2 + 6x - 2y - 1 = 0$ અને $x^2 + y^2 - 12x + 4y = 1$ are collinear points.

(46) Find the cartesian equation of the circle whose parametric equations are $x = -4 + 5\cos\theta$ and $y = 3 - 5\sin\theta$, $\theta \in (-\pi, \pi]$

(47) Find the radius of the circle of which $12x + 5y + 16 = 0$ and $12x + 5y - 10 = 0$ are tangents

(48) Get the equation of the circle passing through the points (0, 0), (0, 1) and(1, 0)

(49) Get the equation of the circle with radius 5 and touching the X-axis at the origin.

(50) Obtain the equation of a circle touching x-axis and having its centre at (4,-3)

(51) Find length of tangent from (6, -5) to $x^2 + y^2 = 49$

(52) If the line $3x - 4y + 10 = 0$, is a tangent to the circle $x^2 + y^2 = 4$ then find the point of contact co-ordinates.

(53) Find the length of the chord form by the circle $x^2 + y^2 - 6x - 4y - 12 = 0$ on the y-axis

(54) If one end point of a diameter of the circle $x^2 + y^2 + 2x - 3 = 0$ is $\left(0, \sqrt{3}\right)$ find the other end.

(55) Get the equation of the tangent of (7,7) to the parabola $y^2 = 7x$

(56) Find the length of a chord of parabola $y^2 = 16x$ cut by the line $y = x$

(57) Get the tangent to $y^2 = 12x$ at the point $t = 2$

(58) If the line $9x - 3y + k = 0$ is tangent to the parabola $y^2 = 4x$ find K and the point of contact.

(59) Obtain the co-ordinates of end points of a latus rectum of parabola $x^2 = 24y$

(60) Find the equation of the tangent to the parabola $y^2 = 8x$ at its point (2,4)

(61) If the x-coordinate of a point on the parabola $y^2 = 2x$ other than vertex is double to its y-co ordinate then find co-ordinates of this point.

(62) A tangent to the parabola $y^2 = 9x$ makes the angle of measure $\frac{\pi}{4}$ with the positive direction of the X-axis. Get the co-ordinates of the point of contact.

(63) Find the length of Latus rectum and co-ordinates of the end points of latus rectum of the parabola $x^2 = -12y$

(64) Find the point of contact co-ordinates of tangent to a parabola $y^2 = 8x$ forming equal intercepts on the axes.

(65) For the parabola $x^2 = 12y$ find the area of the triangle, whose vertices are the vertex of the parabola and the two end-points of its latus-rectum.

(66) Find the equation of the set of all mid-points of chords of parabola $y^2 = 4ax$ which subtends right angled at vertex.

(67) Find the equations of tangents drawn from the point (0,3) to the parabola $y^2 = 4x$

(68) Get the standard equation of the parabola having focus (0, -2) and directrix y=2

(69) Find the equations of the tangents at the end-points of the latus-rectum of the parabola $y^2 = 4ax$

(70) Foot of perpendicular from focus of the parabola $y^2 = 4ax$ on the any tangent to parabola lies on the which line ?

(71) Obtain the equation of the auxiliary circle of the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$

(72) Obtain the equation of the director circle of the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$

(73) Obtain the eccentricity of the ellipse $3x^2 + 2y^2 = 6$

(74) If the line y=2x+c is tangent to the ellipse $\frac{x^2}{16} + \frac{y^2}{4} = 1$ then find C

(75) Write the equation of tangent to the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$ at the point (3,-2)

(76) Obtain the equation of the ellipse having its length of minor axis is 6 and distance between foci is 8.

(77) Find the tangents to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ that make an angle of measure $\frac{\pi}{3}$ with x-axis.

(78) Get the equation of ellipse having vertices $(\pm 5,0)$ and foci $(\pm 4, 0)$

(79) Get the equation of the tangents at the points on the ellipse $2x^2 + 3y^2 = 6$ whose y-co-ordinate is $\frac{2}{\sqrt{3}}$

(80) Find the eccentricity of the ellipse in which the distance between the two directrices is three times the distance between the two foci.

(81) Find measure of eccentric angle of point $\left(\frac{3}{2}, \frac{6\sqrt{2}}{2}\right)$ on the ellipse $\frac{x^2}{9} + \frac{y^2}{36} = 1$

(82) Find measure of eccentric angle of point (0,-1) on the ellipse $\frac{x^2}{16} + y^2 = 1$

(83) Find the equation of horizontal tangent to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1 \ (a < b)$

(84) Get the equation of the ellipse having length of its major axis 8 and eccentricity $e = \frac{1}{\sqrt{2}}$

(85) If the length of minor axis 4 and distance between foci is 2 find the equation of ellipse.

(86) Find the equationof the tangent of the point $\left(3, \frac{3}{\sqrt{2}}\right)$ on the ellipse $x^2 + 2y^2 = 18$.

(87) Obtain the standard equation of the hyperbola having its foci $(0, \pm\sqrt{10})$ and passes through (2, 3)

(88) Get the equation of the tangents at (2,1) to the hyperbola $3x^2 - 2y^2 = 10$

(89) Obtain the standard equation of the hyperbola passing through (5, -2) and length of transverse axis is 7.

(90) Find the equation of the hyperbola for which the distance from one vertex to the two foci are 9 and1.

(91) Show the line $3x - 4y = 5$ touches the hyperbola $x^2 - 4y^2 = 5$ Also find the point of contact.

(92) Obtain the equation of the tangent to hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ cutting equal intercepts on the axes.

(93) Find the length of latus-rectum of the hyperbola $3x^2 - 12y^2 = 36$

(94) Get the equations of the tangents to the hyperbola $\frac{x^2}{4} - \frac{y^2}{3} = 1$ that are parallel to the line $x - y + 2 = 0$

(95) Find the measure of angle between the asymptotes of $3x^2 - 2y^2 = 1$

(96) Find $y=mx+3$ is tangent to $\frac{x^2}{2} - \frac{y^2}{9} = 1$ then find m.

(97) If $\bar{x} \perp \bar{y}$ and $|\bar{x}| = |\bar{y}| = 1$ then find $|\bar{x} \times \bar{y}|$

(98) Find the direction angles of $\bar{i} + \bar{j} + \bar{k}$

(99) Find the projection vector of $3\bar{i} + 4\bar{j} + \bar{k}$ on $\bar{i} + \bar{j} - \bar{k}$

(100) If $\bar{x} = (1,2,3)$ and $\bar{y} = (1,2,1)$, $z = (2,1,1)$ then find $\bar{x} \times (\bar{y} \times \bar{z})$

(101) Find unit vector in the direction of $\bar{x} = (1, 2, -3)$

(102) Find unit vectors orthogonal to $\bar{i} + \bar{j} - 2\bar{k}$

(103) Find direction cosines of $\bar{i} + \bar{k}$

(104) Find the magnitude of vector addition of vectors $\bar{a} = (2,1,1)$ and $\bar{b} = (1,2,3)$

(105) Find x and y if $x(1, 1) + y(2, 1) = (3, 2)$

(106) If $\bar{x} = (3,-6,2)$ and $\bar{y} = (6,2,-3)$ then find $(\bar{x} \wedge \bar{y})$

(107) Verify that (1, 2, 3) and (2, 1, 3) are collinear or not ?

(108) Find the unit vectors perpendicular to both $\bar{x} = (1,2,-1)$ and $\bar{y} = (4,5,6)$

(109) Check that the vectors (1, -2, 3), (-2, 3, 2), (-8, 13, 0) are coplaner or not ?

(110) If (1, -1) and (-2, m) are collinear then find m.

(111) Does $\bar{x} \cdot \bar{y} = \bar{x} \cdot \bar{z} \Rightarrow \bar{y} = \bar{z}$ implies Why ? Also prove it by illustration.

(112) If $\bar{a}$, $\bar{b}$ and $\bar{a} \times \bar{b}$ are unit vectors then find $(\bar{a} \,\hat{}\, \bar{b})$

(113) If the measure of the angle between $\bar{i} + \sqrt{3}\bar{j}$ and $\sqrt{3}\bar{i} + a\bar{j}$ is $\frac{\pi}{3}$ find a.

(114) Force $\bar{i} + \bar{j} + \bar{k}$ is applied at B (1, 2, 3) Find the torque around A (-1, 2, 0) and its magnitude.

(115) If $\vec{OA} = \bar{i} + 2\bar{j} + \bar{k}$ and $\vec{OB} = 3\bar{i} - 2\bar{j} + \bar{k}$ find the area of ΔOAB

(116) Two forces $2\bar{i} + 3\bar{j} + 4\bar{k}$ and $3\bar{i} + 4\bar{j} - 5\bar{k}$ together cause the displacement $3\bar{i} + 5\bar{j} + \bar{k}$ Find the work done.

(117) If the centroid of ABC whose Vertices at A (a, 2, -3), B (2, b, 1) and C (-3, 1, c) is origin then find a, b, and c.

(118) If A (0,1, -2), B (1, -2, 0) and C (-2, 0, 1) are the vertices of an equilateral triangle then find the position vector of its incentre.

(119) Find the area of a parallelogram, if its diagonals are $2\bar{i} + \bar{k}$ and $\bar{i} + \bar{j} + \bar{k}$

(120) Using vectors show that A (1, 1), B (2, 2), C (3, 3) are collinear points.

(121) Give an illustration satisfying $|\bar{x} \cdot \bar{y}| < |\bar{x}| \, |\bar{y}|$

(122) (2a, a, -4) and (a, -2, 1) are mutually perpendicular then find a.

(123) Find the unit vector which makes equal measure angles with $\bar{i}$, $\bar{j}$, $\bar{k}$

(124) Show that: $\left|\bar{a}+\bar{b}\right| = \left|\bar{a}-\bar{b}\right| \Leftrightarrow \bar{a} \perp \bar{b}$

(125) Find the volume of the parallelopiped three of whose edges $\vec{OA} = (2,1,1,)$, $\vec{OB} = (3,-1,1)$ and $\vec{OC} = (-1,1,-1)$

(126) If $\vec{OA} = \bar{i} + 2\bar{j} + 3\bar{k}$ and $\vec{OB} = -3\bar{i} - 2\bar{j} + \bar{k}$ find the area of ΔABC

(127) If $\bar{a} = (1,2,1)$ and $\bar{b} = (2,2,1)$ then find $\operatorname{Proj}_{\bar{a}}\bar{b}$

(128) Write the equation of the line passing through A (1, 2, 3) and having the direction (1, 1, 1) in the vector form and also in the symmetric form.

(129) Show that A (1, 2, 0), B (3, 1, 1), C (7, -1, 3) are collinear points.

(130) Find C if the lines $\frac{x-1}{c} = \frac{y+2}{-2} = \frac{z-3}{4}$ and $\frac{x-5}{1} = \frac{y-3}{1} = \frac{z+1}{c}$ have the same directions.

(131) Find the measure of angle between $\frac{x}{2} = \frac{y}{2} = \frac{z}{1}$ and $\frac{x}{2} = \frac{y}{-1} = \frac{z}{-2}$

(132) Find the perpendicular distance between x = y = z and x - 1 = y - 2 = z - 3

(133) Obtain the distance of (1,0,0) from $\frac{x}{2} = \frac{y}{2} = \frac{z}{1}$

(134) Find the equation of the line passing through the origin and making equal angles with all the three co-ordinate axes.

(135) Find direction cosines of the line given by x = ay + b and z = cy + d

(136) Find the measure of the angle between the two lines whose direction cosines are 7,-5,1 and 1,2,3 respectively.

(137) If the lines $\frac{x-1}{-3} = \frac{y-2}{2a} = \frac{z-3}{2}$ and $\bar{r} = (1,5,6) + k(3a,1,-5)$ $k \in R$ are mutually perpendicular then find a.

(138) Find the equation of the plane passing through (1, 1, 2) and (2, 1, 2), (1, 3, 1)

(139) The normal to a plane makes angles of measures $\pi/4$, $\pi/4$ and $\pi/3$ with positive directions of the x-axis, y-axis and z-axis respectively. The perpendicular from the origin to the plane has length $\sqrt{2}$. Find the equation of the plane.

(140) Prove that the line $\bar{r} = (2,3,4,) + k\,(3,4,5)$, $k \in R$ is parallel to the plane 2x + y - 2z = 3

(141) Find the unit vector in the direction of the normal of $\bar{r} \cdot (6,3,-2) + 1 = 0$

(142) Find the intercepts on axes of the plane $\bar{r} \cdot (3,6,-9) = 3$

(143) If foot of the perpendicular from origin to plane is (4,-2,-5) then find the equation of the plane.

(144) Obtain the perpendicular distance of the plane $2x-3y+6z=63$ from the point (1, -2, 8)

(145) Find the equation of the plane passing through (1,1,3) which is parallel to $2x+y+z=2$

(146) Obtain the equation of the sphere whose end points of diameter are A (1, 2, 3) and B (4, 3, 2)

(147) Obtain the vector equation of the sphere whose centre at (3, 6, 7) and radius 8

(148) Find the centre and radius of the sphere $|\bar{r}|^2 - \bar{r} \cdot (4,2,6) - 2 = 0$

(149) Find the x-intercept of the sphere $x^2+y^2+z^2-2x-2y-2z=0$

(150) If one end of the diameter of the sphere $x^2+y^2+z^2=29$ is (2,-3,-4) find the another end point.

(151) Find the equation of the sphere passing through the points (0, 0, 0), (0, 1, 0), (0, 0, 1), (1, 0, 0)

(152) Does the equation $|\bar{r}|^2 - \bar{r} \cdot (2,1,1) + 3 = 0$ represents the sphere ? If 'yes' then find the radius.

(153) $\begin{aligned} f(x) &= kx^2 \ ; \ x \le 2 \\ &= 3 \qquad x > 2 \end{aligned}$ If f is continuous at x=2 then find K.

(154) Find $\lim_{x\to 1} \dfrac{x^7-1}{x^{21}-1}$ where $x \in R - \{1\}$

(155) Find the complement set of $\left\{ x \,/\, \dfrac{1}{|2x+3|} \le \dfrac{1}{4} \ , \ x \in R - \left\{\dfrac{-3}{2}\right\} \right\}$

(156) Find $\lim_{x\to 0} \dfrac{\tan 5x - 3x}{4x - \sin 2x}$

(157) Find $\lim_{x\to 0} \dfrac{\sin(x^0)}{x}$

(158) If $\lim_{x\to 2} \dfrac{x^n - 2^n}{x-2} = 80$ then find $n \in N$

(159) Find $\lim_{x\to 0} \dfrac{1-\cos x}{x^2}$

(160) Find $\lim_{x\to 1} \dfrac{\log_e x}{1-x}$

(161) Find $\lim_{n\to \infty} \dfrac{\Sigma n}{n^2}$

(162) Find $\lim_{x\to 0} \dfrac{2}{x} \log(1+x)$

(163) If it neighbourhood form possible to express N(2, -1) then express in form an interval.

(164) Find $\lim_{x\to\infty} x\left(\sqrt[x]{2}-1\right) = \ldots\ldots$

(165) Find $\lim_{x\to 0^+} \frac{|x|}{x}$ તથા $\lim_{x\to 0^-} \frac{|x|}{x}$

(166) Find $\lim_{x\to 0} \frac{x\left(e^x-1\right)}{1-\cos x}$

(167) Find $\lim_{x\to 0} \frac{\sum_{i=1}^{100}\sin^2(ix)}{x^2}$

(168) Find $\frac{d}{dx}\left(\log_{a^n} x^n\right)$, $a \in R^+ - \{1\}$

(169) Find $\frac{d}{dx}\left(x^3+3^x+3^3\right)$

(170) If $y = \cos^2 x$ then find $\frac{d^2y}{dx^2}$

(171) Find derivative of $\sin^{-1} x$ w.r.t. $\cos^{-1} x$

(172) Find $\frac{d}{dx}\left(x^{\sin x}\right)$

(173) Find $\frac{d}{dx}\left(x^{-\log(1-x)}\right)$

(174) Find $\frac{d}{dx}\left(\log_{10}\left(x^2+1\right)\right)$

(175) Find $\frac{d}{dx}\sin\left(x^x\right)$

(176) If $y=\sqrt{x+\sqrt{x+\sqrt{x+\sqrt{x+\sqrt{x\ldots\ldots\ldots\infty}}}}}$ then find $\frac{dy}{dx}$

(177) Using definition find the derivative of $\sqrt{x}$

(178) If $y=\sin^{-1}\left(\frac{x}{a}\right)$ then find $\frac{dy}{dx}$ (where $a<0$)

(179) If $y=\log_{10}(\sin x)$ then find $\frac{dy}{dx}$

(180) If $y=\sqrt{1-\sin 2x}$ then find $\frac{dy}{dx}$

(181) If $f(x)=\log_5 x$ then find $f^1(5)$

(182) If $y=e^x \cdot \log\cos x$ then find $\frac{dy}{dx}$

(183) If $x=a\sin\theta$, $y=b\cos\theta$ then find $\frac{dy}{dx}$

(184) If $y=\tan^{-1}\left(\frac{a+bx}{b-ax}\right)$ then find $\frac{dy}{dx}$

(185) If $y=1+x+\frac{x^2}{2!}+\frac{x^2}{3!}+\ldots\ldots\ldots$ then P.T. $\frac{dy}{dx}=y$

(186) Find the point on the curve $y=x^3$ where slope of tangent is equal to its y-co-ordinate

(187) Find approximatevalue of $\sqrt{25.01}$

(188) Find approximate values of $\sin(44^0)$ and $\tan^{-1}(0.49)$

(189) Verify Rolle's theorem for $f(x)=x^2$, $x\in[-2,2]$

(190) Verify that $f(x)=\log\sin x$ is an increasing or decreasing on $(0,\pi/2)$?

(191) Find the rate of change in a area of an equilateral triangle while its length of side increases at the rate $\sqrt{3}$ cm/s when its length of side is 2 m.

(192) Determine, when $f(x)=x^x$ $(x>0)$ is increasing or decreasing function.

(193) Obtain equation of the tangent to curve $x=1-\cos\theta$, $y=\theta-\sin\theta$ at point $\theta=\frac{\pi}{4}$

(194) Find the rate of change in a area of an equilateral triangle w.r.t. its length of side.

(195) Find the equation tangent to a curve $y=be^{\frac{-x}{a}}$ at the point when it intersect the y-axis.

(196) In which interval is $f(x)=(x+2)e^{-x}$ increasing ?

(197) The formula connecting the periodic time T and length l of a pendulum is $T=2\pi\sqrt{\frac{l}{g}}$ If there is an error of 2 % in measuring the length *l*, what will be the percentage error in T ?

(198) Evaluate $\int\frac{1-\tan x}{1+\tan x}dx$

(199) Evaluate $\int\left(\sin x+e^x+4^x+x^4\right)dx$

(200) Evaluate $\int\frac{\left(\operatorname{cosec}^{-1}x\right)^n}{x\cdot\sqrt{x^2-1}}dx$

(201) Evaluate $\int e^{2x} \cdot \sin x \cdot \cos x \ dx$

(202) Evaluate $\int e^{y}\left(1+\tan y+\tan^{2} y\right) \ dy$

(203) Evaluate $\int \sqrt{\sin x} \cdot \sin 2x \ dx$

(204) Evaluate $\int \frac{e^{x}(1+x)}{\sin^{2}\left(x \cdot e^{x}\right)} \ dx$

(205) Evaluate $\int \frac{x^{2}}{1+x^{6}} \ dx$

(206) Evaluate $\int \frac{1}{x \cos^{2}(1+\log x)} \ dx$

(207) Evaluate $\int \frac{\cos x}{\sqrt{2+\sin x}} \ dx$

(208) Evaluate $\int \left(e^{a \log x}+e^{x \cdot \log a}\right) \ dx$

(209) Evaluate $\int \frac{\cot x}{\log(\sin x)} \ dx$

(210) Without using Rule for integration by parts find $\int \log x \cdot \ dx$

(211) Find $\int \frac{1}{x+5x \cdot \log x} \ dx$

(212) Find $\int\left\{\frac{1}{\log_{e} x}-\left(\frac{1}{\log_{e} x}\right)^{2}\right\} dx$

(213) Find $\int\left\{\frac{(x+1)(x+\log x)^{2}}{x}\right\} \ dx$

(214) Find $\int\left\{\frac{1}{x\left(x^{n}+1\right)}\right\} \ dx$

(215) Find $\int\left\{\frac{(1+x)}{(2+x)^{2}}\right\} e^{x} \ dx$

(216) Find $\int \cos(\log x) \, dx$

(217) Find $\int \left(\frac{x^2-1}{x^2}\right) e^{x+\frac{1}{x}}\, dx$

(218) Find $\int_{-\pi/2}^{\pi/2} \cos x \cdot dx$

(219) Find $\int_{-1}^{1} \frac{x^3}{a^2-x^2} \cdot dx \quad (a > 1)$

(220) Find $\int_{-1}^{1} \log\left(\frac{2-x}{2+x}\right) dx$

(221) Evaluate $\int_{0}^{2\pi} \sin^3 x \cdot \cos^2 x \cdot dx$

(222) Evaluate $\int_{-\pi/2}^{\pi/2} \sin^2 x\, dx$

(223) Evaluate $\int_{-1}^{1} \sin^3 x \cdot \cos^4 x \cdot dx$

(224) Evaluate $\int_{0}^{\pi/2} \frac{\sin^3 x}{\cos^3 x + \sin^3 x} dx$

(225) Evaluate $\int_{-\pi}^{\pi} \sqrt{5+x^2}\, dx$

(226) Evaluate $\int_{0}^{\pi/2} \frac{\tan x}{1+\tan x} dx$

(227) Find the area of the region bounded by $y = 2-x$, $x = 0$, $x = 4$ and x=axis

(228) Find the area of the region bounded by the curve $y = \cos x$, x-axis and the lines $x = 0$ and $x = +1$

(229) Find the area of the region bounded by $y=\sin x$, x-axis and lines $x = \frac{-\pi}{2}$ and $x = \frac{\pi}{2}$

(230) Find the area of the region bounded by the curve, $xy = 16$, x-axis and the lines $x = 4$ and $x = 8$

(231) Find the area of the region bounded by $x^2 + y^2 = 1$

(232) Find the area of the region bounded by $y = \tan x$, x-axis and lines $x = 0$, and $x = \pi/4$

(233) A particle executing rectilinear motion travels distance xcm in t sec. where $x = 2t^3 - 9t^2 + 5t + 8$ find velocity at $t = 5$ sec.

(234) Obtain the order and degree of the differential equation $\frac{dy}{dx} + \frac{1}{\left(\frac{dy}{dx}\right)} = 5$

(235) An object is projected in vertical direction with velocity 98 m/s find the distance travelled in the 11^{th} second.

(236) A ball is projected vertical direction with a velocity 19.6 m/sec. find the time taken to attain maximum height.

(237) Verify $y = \cos x$, $x \in R$ is a solution of the differential equation $\frac{d^2y}{dx^2} + y = 0$

(238) Obtain the degree of the differential equation $\frac{d^2y}{dx^2} + \cos\left(\frac{dy}{dx}\right) + y = 0$

(239) Find the differential equation of the family of parabolas, touching y-axis at origin.

(240) If $x = t^3 - 9t^2 + 3t + 1$ find a when $V = -24$m/s

(241) When will a body falling freely from the height 98 m reach the ground and what will be its velocity at that time ?

(242) A stone falling freely from the terrace of a multistorey building takes 1/4 of a second to fall past a window 6 m high. Find the height of building above the window.. ($g = 10$ m/s^2)

(243) Find the differential equation of the family of curves represented by $y = a\sin(bx + c)$)(where a and c are arbitrary constants)

(244) Obtain the degree of the differential equation $y = x \cdot \left(\frac{dy}{dx}\right)^2 + 5 \cdot \sqrt{1 + \left(\frac{dy}{dx}\right)^2}$

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SECTION : C

- Answers the following questions as directed in the questions. (Each question carry TWO Marks)

(1) A (6, 7), B(-2, 3), C (9, 1) are the vertices of a triangle. Find the co-ordinates of the point where the bisector of $\angle A$ meets $\overline{BC}$

(2) A (6, 2), B (-3, 5), C (4, -2) and p (x, y) are points in the plane and P,B,C are not collinear, prove that the ratio of the areas of ΔPBC and ΔABC is $|x+y-2|:6$

(3) If A (1, -2), B (-7, 1) find a point P on $\overleftrightarrow{AB}$ such that 3AP = 5 PB

(4) Find the length of altitude drawn from the vertex A of a ΔABC having vertices A (2, 3), B (1, 0), C (0,4)

(5) Find a and b if the triangle with vertices (a, -1), (6, -9), and (10, b) has circumcentre at (6, -5)

(6) Show that (-2, -1), (-1, 2), (0, 2) and (-1, -1) are the vertices of a parallelogram.

(7) Prove that not both co-ordinates of all the vertices of an equilateral triangle can be rational numbers.

(8) Show that for the triangle with vertices (1, a), (2, b), (c^2, -3) the centroid never be on the y-axis.

(9) If the points A (1, 2), B (2, 3) and C (x, y) form an equilateral triangle find x and y.

(10) A is (2,9), B (-2,1) and C (6,3) and area of ΔABC is 28, Find the length of the perpendicular line segment from A to $\overline{BC}$

(11) Find the co-ordinates of the points of trisection of the line-segment joining the points (4,5) and (13,-4)

(12) Find the co-ordinates of the points on the line x + 7y + 2 = 0 at a distance $5\sqrt{2}$ from the point (-2,0).

(13) For what value of K would the line through (K, 7) and (2,-5) have slope 2/3 ?

(14) Find the equations of the lines with slope -2 and inter secting x-axis at point distant 3 units from O (0, 0)

(15) Find the equation of the perpendicular bisector of $\overline{AB}$ where A is (-3,2) and B is (7,6)

(16) Which of the lines 2x + 7y - 9 = 0 and 4x - y + 11 = 0 is farther away from the point (2,3) ?

(17) If the points of trisection of a chord of the circle $x^2 + y^2 - 4x - 2y - c = 0$ are (1/3, 1/3) and (8/3, 8/3) find C

(18) If the line 2x+ 3y + k = 0 touches the circle $x^2 + y^2 = 25$ find k.

(19) Get the equation of the circle with centre (2,3) if it passes through the point of intersection of the lines 3x - 2y - 1 = 0 and 4x + y - 27 = 0

(20) Find the length of the chord of the circle $x^2 + y^2 - 6x - 8y - 50 = 0$ intercepted by the line 2x+ y - 5 = 0

(21) Prove that the circles $x^2 + y^2 - 2x - 4y - 20 = 0$ and $x^2 + y^2 - 18x - 16y + 120 = 0$ touch each

other externally.

(22) Get the equations of the tangents drawn from (1,5) to the parabola $y^2 = 24x$ and also find the co-ordinates of the points of contact.

(23) Get the equation of the common tangent of the parabolas $y^2 = 32x$ and $x^2 = 108y$

(24) For the parabola $x^2 = 24y$ find the co-ordinates of focus, the equation of directrix, length of the latus-rectum and the end-points of the latus rectum.

(25) Find the tangents to the parabola $y^2 = 8x$ that are parallel to and perpendicular to the line $x + 2y + 5 = 0$

(26) For the parabola $y^2 = 4ax$ $(a > 0)$ one of the end points of a focal chord is $(at^2, 2at)$ Find the other end point and show that length of this focal chord is $a(t + 1/t)^2$

(27) P is a point on the parabola $y^2 = 12x$ and S is its focus. If SP=6 find the co-ordinates of P.

(28) One end-point of a focal chord of the parabola $y^2 = 16x$ is (4,8) Find the other end-point.

(29) Find the equation of such tangents to parabola $y^2 = 8x$ have their x-intercept -2.

(30) Get the tangent to $y^2 = 12x$ at the point t=2

(31) Find the locus of point P such that the slopes of the tangents drawn from P to a parabola have (1) constantsum (2) constant non-zero product.

(32) A focal chord of the parabola $y^2=4ax$ makes an angle of measure θ with the positive direction of the x-axis. Prove that the length of the focal chord is $4a\,\text{cosec}^2\theta$

(33) For the ellipse $\frac{x^2}{100} + \frac{y^2}{25} = 1$ find the measure of the eccentric angle of the point (-8,3) and find the point on the auxillary circle corresponding to this point.

(34) Get the equations of tangents drawn from (2,3) to the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$

(35) Obtain the distance of the point P $\left(5, 4\sqrt{3}\right)$ on the ellipse $16x^2 + 25y^2 = 1600$ from its foci.

(36) Show that line $\sqrt{12}y = \sqrt{12}x + \sqrt{7}$ is a tangent to the ellipse $3x^2 + 4y^2 = 1$ and find its point of contact co-ordinates.

(37) Find the equation of tangents to the ellipse $3x^2 + 4y^2 = 12$ parallel to the line $3x+y=2$.

(38) If the line $y = -x + c$ is tangent to the ellipse $2x^2 + 3y^2 = 1$ then find the value of c.

(39) Find all points on the ellipse $\frac{x^2}{36} + \frac{y^2}{25} = 1$ that are at the same distance from the two foci.

(40) If measures of the eccentric angles of the end-points of a focal chord of $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ are θ_1 and θ_2 show that $\cos\left(\frac{\theta_1 - \theta_2}{2}\right) = e\cos\left(\frac{\theta_1 + \theta_2}{2}\right)$

(41) Obtain the equations of tangent at (3,1) and (3,-1) to the ellipse $x^2 + 2y^2 = 11$

(42) Show that the line $x + 2y + 5 = 0$ touches the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$ Also find the point of contact.

(43) Find the length of the chord cut off on the line y=x by the ellipse $2x^2 + 3y^2 = 24$

(44) Find the equation of the hyperbola which has the same foci as the ellipse $\frac{x^2}{25} + \frac{y^2}{9} = 1$ and whose eccentricity is 2.

(45) Find the length of the perpendicular from a focus to an asymptote of $x^2 - 4y^2 = 20$

(46) If the eccentricities of $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ and $\frac{y^2}{b^2} - \frac{x^2}{a^2} = 1$ are e_1 and e_2 respectively, prove that $e_1^2 + e_2^2 = e_1^2 \cdot e_2^2$

(47) For $y^2 - 16x^2 = 16$, find the co-ordinate of foci, equation of directrices eccentricity, length of latus rectum and the length of axes.

(48) Find the measure of angle between the asymptotes of $3x^2 - 2y^2 = 1$

(49) If the chord of the hyperbola joining $P(\theta)$ and $Q(\phi)$ on the hyperbola subtends a right angle at the centre C (0, 0) prove that $a^2 + b^2 \sin\theta \cdot \sin\phi = 0$

(50) Find C, if $5x + 12y + c = 0$ touches $\frac{x^2}{9} - \frac{y^2}{1} = 1$ Also find the point of contact.

(51) Find the equations of the tangents from (-2, -1) to the hyperbola $\frac{x^2}{3} - \frac{y^2}{2} = 1$

(52) Obtain the equations of common tangents to the hyperbola $3x^2 - 4y^2 = 12$ and the parabola $y^2 = 4x$

(53) Find the equation of the hyperbola for which the distance from one vertex to the two foci are 9 and 1.

(54) For the rectangular hyperbola $x^2 - y^2 = 9$ consider the tangent at (5,4) Find the area of the triangle, which this tangent makes with the two asymptotes.

(55) Find the equation of the hyperbola, having distance between two directrices is 6 and co-ordinates of foci $(\pm 6, 0)$

(56) S and S^1 are the foci and C (0, 0) the centre of a rectangular hyperbola. Prove that for every point P on the hyperbola, $SP. S^1P = CP^2$.

(57) If $\bar{x}$ and $\bar{y}$ are unit vectors and $\bar{x} \cdot \bar{y} = 0$ then prove that $|\bar{x} + \bar{y}| = \sqrt{2}$

(58) Find x,y,z from x (1, 1, 1) + y (1, 2, 3) + z (0, 1, 0) = (2, 4, 4)

(59) Find a unit vector in R^3 making an angle of measure $\frac{\pi}{3}$ with each of the vectors. (1,-1,0) and (0,1,1)

(60) If $\bar{a}\cdot\bar{b} = \bar{a}\cdot\bar{c} = 0$; $|\bar{a}| = |\bar{b}| = |\bar{c}| = 1$ then prove that $\bar{a} = \pm 2(\bar{b}\times\bar{c})$ where $(\bar{b} \wedge \bar{c}) = \pi/6$

(61) If A,B,C are A (3, 3, 3), B (0, 6, 3), C (1, 7, 7) respectively find D (x, y, z) such that ABCD is a square.

(62) For A (1, 2, 3) and B (5, 6, 7) find the point that divide $\overline{AB}$ from A's side in the ratio -3:2

(63) For A (1, 2, 3) and B (-3, 4, -5) find the division ratio in which XY- plane divides $\overline{AB}$. Also find the position vector of such division point.

(64) For the vectors $\bar{x} = (1, 2, -3)$ and $\bar{y} = (1, -1, 3)$ verify that $|\bar{x}+\bar{y}| \le |\bar{x}| + |\bar{y}|$

(65) If A is (-1,2,0) , B is (1,2,3) and C is (4,2,1) then using vectors method prove that ΔABC is an isosceles right triangle.

(66) Find unit vector perpendicular to (3,4)

(67) Prove that $2\left(|\bar{x}|^2 + |\bar{y}|^2\right) = |\bar{x}+\bar{y}|^2 + |\bar{x}-\bar{y}|^2$

(68) $3\bar{i} + 4\bar{j}$ and $\bar{i} + \bar{j} + \bar{k}$ are adjacent sides of a parallelogram. Find its area.

(69) Using vectors prove that the angle in a semi circle is a right angle.

(70) Using vectors find the formula of $\sin(\alpha + \beta)$

(71) If $\bar{x} = (1,2,-1)$ and $\bar{y} = (2,2,1)$ and $(\bar{x} \wedge \bar{y}) = \alpha$ then find $\sin\alpha$

(72) The vertices of the tetrahedron V-ABC are V (4, 5, 1), A (0, -1, -1), B (1, 2, 3), C (4, 4, 4) Find its volume.

(73) Using vectors find the area of ΔABC whose vertices are A (2, 3), B (3, 2), C (2, 1)

(74) Forces measuring 5,3 and 1 unit act in the directions (6,2,3), (3,-2,6) and (2,-3,-6) respectively. As a result, the particle moves from (2,-1,-3) to (5,-1,1) Find the resultant force and the work done.

(75) Prove that if $\overline{AD}$ is the median in ΔABC then $AB^2 + AC^2 = 2(AD^2 + BD^2)$ (Using vectors)

(76) Find the perpendicular distance of a line $\dfrac{x-6}{3} = \dfrac{y-7}{2} = \dfrac{z-7}{-2}$ from (1,2,3)

(77) If a plane passes through (a,b,c) prove that the foot of the perpendicular from the origin to the plane lies on sphere $x^2 + y^2 + z^2 - ax - by - cz = 0$

(78) Find the equation of the sphere whose centre is (2,3,-4) and which touches the plane $2x + 6y - 3z + 15 = 0$

(79) A variable sphere of constant radius c passes through (0,0,0) and intersects the co-ordinates axes in A,B,C Prove that centroid of ΔABC lies on the sphere $x^2 + y^2 + z^2 = \dfrac{4c^2}{9}$

(80) Find the equation of the sphere passing through the point 0 (0, 0, 0), A (-a, b, c), B (a, -b, c) and C (a, b, -c)

(81) If $f(x)=\dfrac{x^2-x-6}{x-3}$, $x \neq 3$ is continuous at x=3; then find k :

$\quad = k+3 \qquad x=3$

(82) Find $\lim_{x\to 0} \dfrac{\sin 5x - \sin 2x}{\sin x}$

(83) Find $\lim_{x\to 0} \dfrac{2\sin x - \sin 2x}{x^3}$

(84) Find $\lim_{x\to 0} \dfrac{\sqrt{1+x}-1}{\log(1+x)}$

(85) Find $\lim_{x\to 0} \dfrac{x^2+1-\cos x}{\sin^2 x}$

(86) Find $\lim_{x\to \frac{1}{\sqrt{2}}} \dfrac{x-\cos\left(\sin^{-1}x\right)}{1-\tan\left(\sin^{-1}x\right)}$

(87) Find $\lim_{n\to\infty} \sum_{r=1}^{n} \dfrac{1}{n} 5^{\frac{r}{n}}$

(88) Find $\lim_{n\to\infty} \sum_{r=1}^{n} \dfrac{1}{\left(4r^2-1\right)}$

(89) Find $\lim_{x\to\infty} \dfrac{\tan 5x - 3x}{4x - \sin 2x}$

(90) Find $\lim_{x\to\frac{\pi}{4}} \dfrac{\sin 3x + \cos 3x}{x - \pi/4}$

(91) If $e^x + e^y = e^{x+y}$ then find $\dfrac{dy}{dx}$

(92) If $y = \cos^{-1}\left(4x^3-3x\right)$; $1/2 < x < 1$ then find $\dfrac{dy}{dx}$

(93) If $\cos y = x\cos(a+y)$ then $\dfrac{dy}{dx} = \dfrac{\cos^2(a+y)}{\sin a}$

(94) Using definition of derivative find the derivative of $x^{-7/2}$

(95) Using definition of derivative find the derivative of e^{5x}

(96) Find derivative of $\sin\left(m\cos^{-1}x\right)$ w.r.t. $\cos\left(m\sin^{-1}x\right)$

(97) If $x^y = e^{x-y}$ then prove that $\dfrac{dy}{dx} = \dfrac{\log x}{(\log ex)^2}$

(98) If $y=\tan^{-1}\left(\frac{3x-x^3}{1-3x^2}\right)$; $0<x<\frac{1}{\sqrt{3}}$ then find $\frac{dy}{dx}$

(99) If $x=a\left(\cos\theta+\log\tan\frac{\theta}{2}\right)$ $y=a\sin\theta$ then find $\frac{dy}{dx}$. (where $\theta\in\left(0,\frac{\pi}{2}\right)$, $a\neq 0$

(100) If $y = e^x(\cos x+\sin x)$ then prove that $y_2 - 2y_1 + 2y = 0$

(101) Apply Rolle's theorem f to $f(x)=\cos x-1$; $x\in\left[\frac{\pi}{2},\frac{3\pi}{2}\right]$

(102) Find approximate value of $\sin 59^0$

(103) For $x=\cos t$, $y=\sin t$ find the equation of tangent at $t=\frac{\pi}{4}$

(104) Using mean value theorem for log (1+x) in $[0,x]$ prove that, $0<\frac{1}{\log(1+x)}-\frac{1}{x}<1$

(105) Prove that : $\frac{1}{1+x^2}<\frac{\tan^{-1}x-\tan^{-1}y}{x-y}<\frac{1}{1+y^2}$ $(x>y>o)$

(106) The radius of a spherical soap bubble increases at the rate 0.5 cm/s. Find the rate of increases of its surface area when its radius is 1 cm.

(107) Area of a triangle was obtained using the formula $\Delta=\frac{1}{2}bc\sin A$ was taken to be $A=\frac{\pi}{6}$ If there is an eror of x% in measurement of A, what is the percentage error in the area ? (b, c are constants)

(108) Divide 64 into two parts such that the sum of their cubes is minimum.

(109) Find the point on the parabola $y^2 = 8x$ such that $\frac{dx}{dt}=\frac{dy}{dt}$

(110) Find C applying Mean-Value theorem to $f(x)=\cos^{-1}x$, $x\in[-1,0]$

(111) Find approximate value of $\sin^{-1}(0.49)$

(112) Evaluate $\int\frac{\cos(x-a)}{\cos(x+a)}\,dx$

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

(114) Evaluate $\int\frac{1}{2+3\cos x}\,dx$

(115) Evaluate $\int\sec^{-1}x\,dx$ find $(x>0)$

(116) Evaluate $\int x\sqrt{x+2}\,dx$

(117) Evaluate $\int x^{4x}(1+\log x)\,dx$

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

(119) Evaluate $\int \frac{1}{2\sin^2 x + 3\cos^2 x} dx$

(120) Evaluate $\int \sin^3 x \cdot \cos^{10} x \, dx$

(121) Evaluate $\int \frac{1}{1-6x-9x^2} dx$

(122) Prove that $\int_{\pi/6}^{\pi/3} \frac{1}{1+\sqrt{\cot x}} dx = \frac{\pi}{12}$

(123) Evaluate $\int_0^{\pi/4} \frac{1}{4\sin^2 x + 5\cos^2 x} dx$

(124) Prove that $\int_2^7 \frac{\sqrt{9-x}}{\sqrt{x}+\sqrt{9-x}} dx = \frac{5}{2}$

(125) Evaluate $\int_8^{27} \frac{1}{x-\sqrt[3]{x}} dx$

(126) Evaluate $\int_0^3 x^2 (3-x)^{1/2} dx$

(127) Find the area of the region bounded by the circle $x^2 + y^2 = r^2$

(128) Find the area of the region bounded by the curve $y = 4 - x^2$ and x-axis

(129) Solve : $5\frac{dy}{dx} = e^x \cdot y^4$

(130) Solve : $\frac{dy}{dx} + \frac{2y}{x} = e^x$

(131) Solve : $e^{\frac{dy}{dx}} = x+1$, $y(0)=3$, $x>-1$

(132) Solve : $x \cdot \frac{dy}{dx} = y - x\cos^2\left(y/x\right)$

(133) Find the equation of the curve passing through origin and having sub-normal of constant length.

(134) Find the differential equation for the family of the curves represented by $y = c(x - c)^2$, where C is arbitrary constant)

(135) A body projected in vertical direction attains maximum height 50 m. Find its velocity at 25 m height.

(136) The acceleration of a particle is constant and it covers a distance of 600 m. in the 10th second and 720 m. in the 12th second. Find its initial velocity.

(137) Velocity of a particle is 25 m/s and it becomes 55 m/s after 10 seconds. Acceleration is constant. Find the distance travelled during this time-interval.

(138) If initial velocity of projectile is 28 m/s and horizontal range is 40 m. Find measure of angle of projection.

(139) A particle covers equal distance with velocities u m/s and v m/s. Find average velocity during total journey. (Show that it is a harmonic mean of u and v)

(140) A ball is projected vertically upwards with speed 19.6 m/s. (1) Find the time for maximum height and (2) Find maximum height.

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SECTION - D

- Answers the following questions as directed in the questions. (Each of the question carry 3 marks)

(1) Origin is the circumcentre of the triangle with vertices $A\left(x_1, x_1\tan\theta_1\right)$, $B\left(x_2, x_2\tan\theta_2\right)$, $C\left(x_3, x_3\tan\theta_3\right)$ If the centroid of ABC is (a,b) prove that: $\frac{a}{b} = \frac{\cos\theta_1+\cos\theta_2+\cos\theta_3}{\sin\theta_1+\sin\theta_2+\sin\theta_3}$

where $0<\theta_i<\pi/2$ and $x_i>0$, $i=1,2,3$

(2) If P is in the interior of a rectangle ABCD prove that $PA^2 + PC^2 = PB^2 + PD^2$

(3) P is (-5, 1) and Q (3, 5) A divides $\overline{PQ}$ from P's side in the ratio K:1 B is (1,5) and C is (7,-2) Find K so that the area of ΔABC would be 2

(4) Find the co-ordinates of the points on $\overline{AB}$ which divide it into n-congruent parts if A is (1,2) and B is (2,1) from this deduce the co-ordinates of trisection points.

(5) A (0, 1), B (2, 4) are given. Find $C \in \overleftrightarrow{AB}$ such that AB = 3AC

(6) A is (3, 4) and B is (5, -2) Find a point P in the plane such that PA = PB and the area of $\Delta PAB = 10$.

(7) $A\left(2\sqrt{2}, 0\right)$ and $B\left(-2\sqrt{2}, 0\right)$ If $|AP - PB| = 4$ find the equation of the locus of P.

(8) If G and I are respectively the cetroid and incentre of the triangle, whose vertices are A (-2, -1), B (1, -1), and C (1, 3) find IG.

(9) If P is a point on the circumcircle of equilateral ΔABC then prove that $AP^2 + BP^2 + CP^2$ does not depend on the position of P.

(10) Find the equation of the circle passing through the points (5, -8), (2, -9) and (2, 1)

(11) If circles $x^2 + y^2 + 2gx + a^2 = 0$ and $x^2 + y^2 + 2fy + a^2 = 0$ touch each other externally, prove that $g^{-2} + f^{-2} = a^{-2}$

(12) For circles $x^2 + y^2 + 2x + 3y + 1 = 0$ and $x^2 + y^2 + 4x + 3y + 2 = 0$ find the equation of a line containing common chord of both circles also find the length of this chord. .

(13) Prove that the line $x + y = 2 + \sqrt{2}$ touches the circle $x^2 + y^2 - 2x - 2y + 1 = 0$ Find the co-ordinates of the point of contact.

(14) Show that the area of the equilateral triangle inscribed in the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ is $\frac{3\sqrt{3}}{4}\left(g^2+f^2-c\right)$

(15) (-3, 0) and (4,1) are points on a circle at which the tangents are $4x - 3y + 12 = 0$ and $3x+4y-16=0$ respectively. Find the equation of the circle.

(16) Line $3x + 4y + 10 = 0$ cuts a chord of length 6 on a circle. If the centre of the circle is (2,1) find the equation of the circle.

(17) If the equation $3x^2 + (3 - p)xy + qy^2 - 2px = 8pq$ represents a circle, find p and q. Also determine the centre and radius of the circle.

(18) Get the equation of the circle touching both the axes and also touching the line $3x + 4y - 6 = 0$ in the first quadrant.

(19) Find the equation of the circle that touches the x-axis and passes through (1,-2) and (3,-4)

(20) Get the equation of the circle that passes through the origin and that cuts chords of length 8 on x-axis and 6 on y-axis.

(21) Obtain the equation of a circle with radius 5/2 if it passes through (-1, 1), (-1, -4)

(22) Determine the equation of the circle that passes through (4,1), and (6, 5) and whose centre is on the line $4x + y - 16 = 0$

(23) Find the minimum and maximum distances of the point (-7, 2) from points on circle $x^2 + y^2 - 10x - 14y - 151 = 0$

(24) The mid-point of a chord of the circle $x^2 + y^2 = 81$ is (-6, 3) Get the equation of the line containing this chord.

(25) Prove using vectors that the perpendicular bisectors of the sides of a triangle are concurrent.

(26) Using vectors prove that $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ for any ABC in a space.

(27) $\bar{a}$ and $\bar{b}$ are unit vectors with $(\bar{a} \wedge \bar{b}) = \pi/6$ Find the area of the parallelogram whose diagonals are $\bar{a} + 2\bar{b}$ and $2\bar{a} + \bar{b}$

(28) Prove, using vectors, that $\cos(\alpha + \beta) = \cos\alpha \cos\beta - \sin\alpha \sin\beta$

(29) Each of $\bar{a}$, $\bar{b}$, $\bar{c}$ is orthogond to the sum of the two . Also $|\bar{a}| = 3$, $|\bar{b}| = 4$, $|\bar{c}| = 5$ Find $|\bar{a} + \bar{b} + \bar{c}|$

(30) If (a, 1, 1), (1, b, 1), (1, 1, c) are co-planer prove that $\frac{1}{1-a} + \frac{1}{1-b} + \frac{1}{1-c} = 1$

(31) Using vectors system prove that if the diagonals of a parallelogram are congruent then it is a rectangle.

(32) If $|\bar{x}| = |\bar{y}| = 1$ and $(\bar{x} \wedge \bar{y}) = \alpha$ then prove that $\sin\frac{\alpha}{2} = \frac{1}{2}|\bar{x} - \bar{y}|$

(33) If $|\bar{a}| = 3$ and if $\bar{a}$ makes angles of equal measures with all three axes, find this angle.

(34) If $\bar{a}$, $\bar{b}$, $\bar{c}$ are mutually orthogonal and have the same magnitude, prove that $\bar{a} + \bar{b} + \bar{c}$ makes congruent angles with each $\bar{a}$, $\bar{b}$, $\bar{c}$

(35) Prove that if in a tetrahedron, two pairs of opposite edges are orthogonal, so is the third pair.

(36) The dot product with $\bar{i} + \bar{j} + \bar{k}$ of the unit vector having the same direction as the vectors sum of $2\bar{i} + 4\bar{j} - 5\bar{k}$ and $\lambda\bar{i} + 2\bar{j} + 3\bar{k}$ is 1. Find λ.

(37) Prove, by vector methods, that in an isosceles triangle, the median on the base is also the altitude on the base.

(38) If $\bar{x}, \bar{y}, \bar{z}$ are non-coplaner, prove that so are $\bar{x} + \bar{y}$, $\bar{y} + \bar{z}$ and $\bar{z} + \bar{x}$

(39) Find the length and foot of the perpendicular segment from P (1, 2, -3) to the line $\frac{x+1}{2} = \frac{y-3}{-2} = \frac{z}{-1}$

(40) Find the measure of the angle between two lines if their direction cosines l, m, n satisfy $l + m + n = 0$, $l^2 + m^2 - n^2 = 0$

(41) Find the shortest distance between the lines $x = y = z$ and $\frac{x+1}{1} = \frac{y}{2} = \frac{z}{3}$

(42) Find the equation of the line passing through (1,2,3) and perpendicular to the two lines. $\frac{x}{1} = \frac{y}{2} = \frac{z}{-1}$ and $\frac{x-1}{3} = \frac{y}{2} = \frac{z}{6}$

(43) Prove that the lines $\frac{x-1}{3} = \frac{y+1}{2} = \frac{z-1}{5}$ and $\frac{x+2}{4} = \frac{y-1}{3} = \frac{z+1}{-2}$ are skew.

(44) Prove that L : $x - 1 = y + 2 = z - 3$ and M : $x - 2 = y + 3 = z - 5$ are parallel and find the distance between them.

(45) Find the perpendicular distance from A (1, 0,3) to the line $\bar{r} = (4, 7, 1) + k\,(1, 2, -2)$, $k \in R$ Also find the foot of the perpendicular.

(46) If a line makes angles of measures α, β, r and δ with the four diagonals of a cube, prove that $\sin^2\alpha + \sin^2\beta + \sin^2 r + \sin^2\delta = 8/3$

(47) Find the image of A (1, -2, 3) in the plane $x + 2y - 3z = 2$

(48) Obtain the equation of the plane that pass through the line of intersection of the plane $x + 2y + z = 3$ and $2x - y - z = 5$ and through the point (2,1,3).

(49) Prove that lines $\frac{x+3}{2} = \frac{y+5}{3} = \frac{z-7}{-3}$ and $\frac{x+1}{4} = \frac{y+1}{5} = \frac{z-1}{-1}$ are coplaner and find the equation of a plane containing both lines.

(50) If (1, 1,k) and (-3, 0, 1) are at equal perpendicular distances from $3x + 4y - 12z = -12$, find k.

(51) Find the perpendicular distance of the plane passes through A (1, 1, 0), B (0, 1, 1), C (1, 0, 1) from the origin.

(52) Prove that the line $L: \frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and $M: \frac{x-1}{2} = \frac{y}{3} = \frac{z-5}{4}$ are parallel and find the equation of the plane containing them.

(53) Express 2x - 2y + z + 3 = 0 in the form $x\cos\alpha + y\cos\beta + z\cos\gamma = P$ and get the length of the perpendicular to it from the origin, the foot of the perpendicular and direction cosines of the perpendicular.

(54) Find $\lim_{x\to1} \frac{x^{n+1}-(n+1)x+n}{(x-1)^2}$ $(n \in N)$

(55) Show that : $\lim_{x\to a} \frac{xe^{-x}-a\cdot e^{-a}}{x-a} = \frac{1-a}{e^a}$

(56) Find $\lim_{x\to\frac{\pi}{3}} \frac{\sin\left(x-\pi/3\right)}{2\cos x-1}$

(57) Define $f\left(\pi/2\right)$ such that $f(x) = \frac{\sec x-\tan x}{x-\pi/2}$. $x \ne \frac{\pi}{2}$ becomes continuous at $x = \frac{\pi}{2}$

(58) Find $\lim_{h\to0} \frac{\sin(a+3h)-3\sin(a+2h)+3\sin(a+h)-\sin a}{h^3}$

(59) Find $\lim_{x\to5} \frac{\log x-\log 5}{x-5}$

(60) Find $\lim_{x\to\pi} \frac{\sqrt{10+\cos x}-3}{(\pi-x)^2}$

(61) $f(x) = \frac{1}{1-e^{1/x}}$; $x \ne 0$

$\quad 1 \quad ; x = 0$

Is f is continuous at x = 0 ?

(62) If $\lim_{x\to-2} \frac{3x^2+ax+a+3}{x^2+x-2}$ exist then find the value of a and limit.

(63) Find $\lim_{x\to0} \frac{\log(a+x)-\log(a-x)}{x}$; $a > 0$

(64) If $f(x) = \frac{4^x-2^x}{\tan x}$; $x \ne 0$

$= \quad k \quad ; \quad x = 0$

find k so that f is continuous at x = 0

(65) If $y=\cos^{-1}\left(\frac{3+5\cos x}{5+3\cos x}\right)$ then prove that $\frac{dy}{dx}=\frac{4}{5+3\cos x}$

(66) $f(x)=e^x \quad x\geq 0$

$= \log(x+e) \quad x<0$

Is f continuous at $x=0$? Is it differentiable at $x=0$? Why ?

(67) Find $\frac{d}{dx}\tan^{-1}\sqrt{\frac{1-\cos x}{1+\cos x}}$ where $\pi<x<2\pi$

(68) If $\log\left(x^2+y^2\right)=\tan^{-1}\frac{y}{x}$ then find $\frac{dy}{dx}$.

(69) If $y=x^{\sqrt{x}}+\left(\sqrt{x}\right)^x$; $x>o$ then find $\frac{dy}{dx}$.

(70) If $x=a\cos^3\theta$, $y=a\sin^3\theta$ then find y_2.

(71) If $x=a\sin t-b\cos t, y=a\cos t+b\sin t$ then find y_2

(72) Using definition find the derivative of $\sqrt{\sin x}$ w.r.t. x.

(73) Find $\frac{d}{dx}\left(e^x\cdot\cos x+e^{x\cos x}+x^{\cos x}\right)$

(74) Verify Mean value theorem and find c for $f(x)=x+\frac{1}{x}$; $x\in[1,3]$

(75) Show that the semi vertical angle of a right circular cone of given slant height and maximum volume is $\tan^{-1}\sqrt{2}$

(76) Prove that $\log(1+x)>x-\frac{x^2}{2}, x>0$

(77) The kinetic energy of a moving body is given by $k=\frac{1}{2}mv^2$. If the mass m is constant and if there is a 2 % increase in kinetic energy, what percentage increases will be there in the velocity ?

(78) For the circle and sqaure the sum of their perimeter is constant. If sum of their area is minimum then prove that length of a side of a square and radius of circle are in the ratio 2 : 1.

(79) Prove that : If $x>0$ then $\frac{x}{1+x^2}<\tan^{-1}x<x$.

(80) Find the <u>local</u> and <u>global</u> maximum and minimum values of $f(x)=x^{50}-x^{20}$, $x\in[0,1]$.

(81) Verify Rolle's theorem for $f(x)=\sin x+\cos x-1$, $x\in\left[0,\frac{\pi}{2}\right]$.

(82) Show that the sum of the intercepts on coordinate axes of the tangent at any point to the curve $\sqrt{x}+\sqrt{y}=\sqrt{c}$ is constant $(c>0)$

(83) Prove that $x^2 + y^2 = ax$, and $x^2 + y^2 = by$ are orthogonal $(a \neq 0, b \neq 0)$.

(84) Water is running out of a conical funnel at the rate of 5 $(cm)^3/s$. When the slant height of the water-cone is 4 cm, find the rate of decrease of the slant height of the water-cone, given that the semi-vertical angle of funnel has measure $\frac{\pi}{3}$.

(85) Prove that $\tan - x$, $x \in \left(0, \frac{\pi}{2}\right)$ is strictly increasing. Deduce $\tan x > x$, $x \in \left(0, \frac{\pi}{2}\right)$.

(86) Evaluate $\int \frac{1}{3\cos x + 4\sin x + 5} dx$.

(87) Evaluate $\int \frac{x^2 + 1}{x^4 + 7x^2 + 1} dx$.

(88) Evaluate $\int \frac{1}{\sin x (3 + 2\cos x)} dx$.

(89) Evaluate $\int \sec^3 x \, dx$.

(90) Evaluate $\int \frac{\sqrt{1 - \sin x}}{1 + \cos x} e^{-x/2} dx$, $\left(0 < x < \frac{\pi}{2}\right)$.

(91) Evaluate $\int x\sqrt{2ax - x^2} \, dx$, $(a > 0)$.

(92) Evaluate $\int \sin^4 x \cdot \cos^2 x \, dx$.

(93) Evaluate $\int \frac{1}{\cos\alpha + \cos x} dx$.

(94) Evaluate $\int x^2 \sqrt{a^6 - x^6} \, dx$, $(a > 0)$.

(95) Evaluate $\int \cos 2x \cdot \cos 4x \cdot \cos 6x \, dx$.

(96) Obtain $\int_0^{\pi/2} \sin x \, dx$ as the limit of a sum.

(97) Evaluate $\int_1^2 \frac{1}{\sqrt{(x-1)(2-x)}} dx$.

(98) If $\int_0^k \frac{dx}{2 + 8x^2} = \frac{\pi}{16}$ then find k.

(99) Prove that $\int_0^{\pi} \frac{x \tan x}{\sec x + \cos x} dx = \frac{\pi^2}{4}$.

(100) Find the area of the region bounded by the curve $y^2 = 4x$ and the line $y = 2x - 4$.

(101) Prove that $\int_0^{\pi/2} \frac{\cos^2 x}{\sin x + \cos x} dx = \frac{1}{\sqrt{2}} \log\left[\sqrt{2}+1\right]$.

(102) Find the area of the region bounded by the curves $y^2 = 9x$ and $x^2 = 9y$.

(103) Find the area of the region bounded by the curves $y = 5 - x^2$, $x = 2$, $x = 3$ and x-axis.

(104) Obtain definite integral $\int_{\log 3}^{\log 7} e^x \, dx$ as the limit of a sum.

(105) Find the area of the region enclosed by $9x^2 + 4y^2 = 36$.

(106) Evaluate $\int_0^1 \frac{\log(1+x)}{1+x^2} dx$.

(107) Evaluate $\int_0^{\pi/2} \frac{dx}{1 - 2a\cos x + a^2}$, $(0 < a < 1)$.

(108) Solve $\frac{dy}{dx} + \frac{y}{x} = \log x$.

(109) Solve $x\frac{dy}{dx} - y + x \sin\left(\frac{y}{x}\right) = 0$.

(110) Solve $\frac{dy}{dx} = \sin(x+y)$.

(111) Solve $x \frac{dy}{dx} + y = x^3$.

(112) Solve $x \cdot e^{y/x} - y + x \cdot \frac{dy}{dx} = 0$; $y(e) = 0$

(113) Solve $\frac{dy}{dx} = \frac{y}{x} + \tan\left(y/x\right)$.

(114) Solve $\left(1 + e^{x/y}\right) dx + e^{x/y}\left(1 - \frac{x}{y}\right) dy = 0$.

(115) Solve : $x \cdot \frac{dy}{dx} = y\left[\log y - \log x + 1\right]$.

(116) Solve : $\frac{dy}{dx} + 2y = \sin x$.

(117) A curve passes through (3, -4) slope of tangent at any point (x,y) is $\frac{2y}{x}$. Find the equation of the curve.

(118) Find the differential equation of the family of circles having centre on x-axis and radius 1 unit.

(119) If the distance of a particle executing rectilinear motion is x at time t and $x = t^3 - 6t^2 - 15t$, during which interval is $V < 0$ and $a > 0$?

(120) For a particle executing rectilinear motion if $t = ax^2 + bx + c$, then prove that,

(i) $V = \frac{1}{2ax + b}$

(ii) Magnitude of accleration is inversely proportional to cube of its distance from a fixed point,.

(121) A body is projected in vertical direction from the top of a tower 98 m high with velocity 39.2 m/s. With what velocity will it strike the ground ? For how much time it will remain in the air ? What is the maximum height ?

(122) Acceleration is constant. Instantaneous speed is 22 m/s. The particle cover 10320 m. in 60 seconds. Find the acceleration.

(123) Initial velocity is u and maximum height is h, prove horizontal range is $R = 4\sqrt{h\left(\frac{u^2}{2g} - h\right)}$

(124) Velocity of a projectile at the maximum height is $\sqrt{\frac{2}{5}}$ times its velocity at half the maximum height. Prove that angle of projection has measure $\frac{\pi}{3}$.

(125) Two bodies fall freely from heights h_1 and h_2 respectively. Prove that the ratio of their time to reach the ground is $\sqrt{\frac{h_1}{h_2}}$.

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SECTION : E

- **Answers the following questions as directed in question. (Each question carry 5 marks)**

(1) Find the equations of the lines passing through (2,3) and making an angle of measure $\frac{2\pi}{3}$ with the y-axis.

(2) A is (1,3) in ΔABC and the lines x-2y+1=0 and y-1=0 contain two of the medians of the triangle. Find the co-ordinates of B and C.

(3) Find the equation of the line that passes through the point of intersection of 3x-4y+1=0 and 5x+y-1=0 and that cuts off intercepts of equal magnitude on the two axes.

(4) Show that the quadrilateral formed by the lines $ax \pm by + c = 0$ is a rhombus and that its are is $\frac{2c^2}{|ab|}$.

(5) A is (-4,-5) in ΔABC and the lines 5x+3y-4=0 and 3x+8y+13=0 contain two of the altitudes of the triangle. Find the co-ordinates of B and C.

(6) Obtain the equations of lines bisecting the angles between the lines 3x+4y+2=0 and 5x-12y+1=0 and show that the bisecting lines are perpendicular to each other.

(7) In ΔABC, C is (4,-1). The line containing the altitude from A is 3x+y+11=0 and the line containing the median $\overline{AD}$ through A is x+2y+7=0. Find the equations of lines containing the three sides of the triangle.

(8) Equations of lines containing the sides of a parallelogram are $y=m_1x+c_1$, $y=m_1x+c_2$, $y=n_1x+d_1$ and $y=n_1x+d_2$ $(c_1 \neq c_2, d_1 \neq d_2)$. Find the area of this parallelogram.

(9) Find the equations of the lines through (-3,-2) that are parallel to the lines bisecting the angles between the lines 4x-3y-6=0 and 3x+4y-12=0

(10) Find the equation of the line passing through $\left(\sqrt{3}, -1\right)$ if its perpendicular distance from the origin is $\sqrt{2}$.

(11) Determine the equations of the perpendicular bisectors of the sides of ΔABC where A is (1,2), B (2,3), C(-1,4). Use these to get the co-ordinates of the circumcentre.

(12) The lines x-2y+2=0, 3x-y+6=0 and x-y=0 contain the three sides of a triangle. Determine the co-ordinates of the orthocentre without finding the co-ordinates of the vetices of the triangle.

(13) Find the area of the triangle formed by the lines x+4y=9, 9x+10y+23=0 and 7x+2y=11.

(14) Find the equation of the line passing through origin and containing a line-segment of length $\sqrt{10}$ between the lines 2x-y+1=0 and 2x-y+6=0.

(15) If the point (o,k) belongs to the circle passing through the points (2,3), (0,2) and (4,5) find k.

(16) Get the equation of the circle that passes through the origin and cuts chords of length 5 on the lines $y = \pm x$

(17) Find the limit $\lim_{x \to 0} \frac{(1+mx)^n - (1+nx)^m}{x^2}$, $(m, n \in N)$

(18) $f(x) = 3x+1 \quad , x \le 3$

$= kx - 26, \ 3 < x < 5$

$= x^2 + a \ , \ x \ge 5$ is continous , find k and a .

(19) Find the limit $\lim_{x \to 0} \dfrac{(x+a)^2 \cdot \sin(x+a) - a^2 \sin a}{x}$.

(20) If $f(x) = x + a\sqrt{2}\sin x \quad ; \ 0 \le x < \pi/4$

$= 2x\cot x + b \quad ; \ \pi/4 \le x < \pi/2$

$= a\cos 2x - b\sin x \quad ; \ \pi/2 \le x \le \pi$

is continuous on $[0, \pi]$, find a and b.

(21) Find the limit $\lim_{x \to 1} \left[\dfrac{m}{1-x^m} - \dfrac{n}{1-x^n}\right]$. $m, n \in N$

(22) Find the limit $\lim_{x \to -1^+} \dfrac{\sqrt{\pi} - \sqrt{\cos^{-1} x}}{\sqrt{x+1}}$

(23) If $y = (\tan^{-1} x)^2$, then prove that $(1+x^2)^2 y_2 + 2x(1+x^2)y_1 = 2$.

(24) Find $\dfrac{d}{dx}\left(\cos^{-1}(4x^3 - 3x)\right)$. $0 < x < 1/2$ and $1/2 < x < 1$

(25) If $x = a(\theta + \sin\theta), \ y = a(1+\cos\theta)$, then prove that $y_2 = -\dfrac{a}{y^2}$

(26) If $y = \sin(m\sin^{-1} x)$ then prove that $(1-x^2)y_2 - xy_1 + m^2 y = 0$.

(27) If $x^y + y^x = 1$ then find $\dfrac{dy}{dx}$.

(28) If $y = x \cdot \log\left(\dfrac{x}{a+bx}\right)$ then prove that $x^3 y_2 = (xy_1 - y)^2$

(29) If $y = \cos^{-1}\left(\dfrac{1-x^2}{1+x^2}\right)$ then find $\dfrac{dy}{dx}$.

(30) $f(x) = 5 + 7x \quad ; x \ge 0,$

$= 10x + 5 \ ; \ x < 0$. Is f differentiable at $x = 0$? Is it continuous at x=0 ? Why ?

(31) If $y = \sin^{-1}\left(2x\sqrt{1-x^2}\right)$, $\dfrac{1}{\sqrt{2}} < |x| < 1$, then find $\dfrac{dy}{dx}$.

(32) If $y = \tan^{-1}\left(\dfrac{3x - x^3}{1 - 3x^2}\right)$, $0 < x < 1/\sqrt{3}$ then find $\dfrac{dy}{dx}$.

(33) If $y = a\cos(\log x) + b\sin(\log x)$, then prove that $x^2 y_2 + x y_1 + y = 0$

(34) If $x = a(\cos\theta + \theta\sin\theta)$, $y = a(\sin\theta - \theta\cos\theta)$, then prove that $y_2 = \dfrac{\sec^3\theta}{a\theta}$.

(35) If $x = (\cos t)^{\sin t}$ and $y = (\sin t)^{\cos t}$, $0 < t < \dfrac{\pi}{2}$ then prove that $\dfrac{dy}{dx}$.

(36) If $2x = y^{1/m} + y^{-1/m}$ $(x \geq 1)$ then prove that $(x^2 - 1)y_2 + x\,y_1 = m^2 y$.

(37) Evaluate $\displaystyle\int \frac{1}{(x+1)^{3/4}\,(x+2)^{5/4}}\,dx$.

(38) Evaluate $\displaystyle\int \frac{1}{x^4 + 1}\,dx$.

(39) Evaluate $\displaystyle\int \frac{\sin 7x}{\sin x}\,dx$.

(40) Evaluate $\displaystyle\int \frac{x^2}{x^4 + x^2 + 1}\,dx$.

(41) Evaluate $\displaystyle\int \frac{\sin x}{\sin 3x}\,dx$.

(42) Evaluate $\displaystyle\int \frac{2x - 3}{(x-1)(x-2)(x-3)}\,dx$.

(43) Evaluate $\displaystyle\int \sqrt{\frac{x-1}{x-3}}\,dx$ $(x > 3)$.

(44) Evaluate $\displaystyle\int \frac{1}{(b^2 + x^2)^{3/2}}\,dx$.

(45) Evaluate $\displaystyle\int \frac{1}{\sin^4 x + \cos^4 x}\,dx$.

(46) Evaluate $\displaystyle\int \frac{e^x}{\sqrt{5 - 4e^x - e^{2x}}}\,dx$.

(47) Evaluate $\displaystyle\int \frac{\sqrt{\cos x}}{\sin x}\,dx$.

(48) Evaluate $\int \frac{x^2}{x^4+1} dx$.

(49) Evaluate $\int \left(\sqrt{\tan x} + \sqrt{\cot x}\right) dx$.

(50) Evaluate $\int \frac{1}{1+5e^x+6e^{2x}} dx$.

(51) Obtain definite integral $\int_0^2 (e^x - x)\, dx$ as the limit of a sum.

(52) Prove that $\int_0^{\pi/2} \frac{x \sec x}{1+\tan x} dx = \frac{\pi}{2\sqrt{2}} \log\left(\sqrt{2}+1\right)$.

(53) Evaluate $\int_{\pi/3}^{\pi/2} \frac{\sqrt{1+\cos x}}{(1-\cos x)^{5/2}} dx$.

(54) Prove that $\int_0^{\pi/4} \tan^n x\, dx + \int_0^{\pi/4} \tan^{n-2} x\, dx = \frac{1}{n-1}$, $n \in N - \{1\}$.

(55) Evaluate $\int_0^{\pi/2} \frac{dx}{2\cos x + 4\sin x}$

(56) Prove that $\int_{-a}^{a} \sqrt{\frac{a-x}{a+x}}\, dx = a\pi$.

(57) Find the area of the region bounded by the curves $x^2 + y^2 = a^2$ and $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1, (0 < b < a)$.

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