

SECTION - A**10 × 2 = 20****VERY SHORT ANSWER TYPE QUESTIONS**

Attempt all questions. Each question carries 2 marks.

1. Find the equation of the straight line passing through $(-4, 5)$ and cutting off equal intercepts on the co-ordinate axes.
2. Find the foot of the perpendicular from $(3, 0)$ to the line $5x + 12y - 41 = 0$.
3. Show that the points $A(-4, 9, 6)$, $B(-1, 6, 6)$ and $C(0, 7, 10)$ form a right angled isosceles triangle.
4. Find the equation of the plane through the points $(2, 2, -1)$, $(3, 4, 2)$, $(7, 0, 6)$.
5. Evaluate $\lim_{x \rightarrow 0} \left(\frac{\sqrt{1+x} - 1}{x} \right)$.
6. Evaluate $\lim_{x \rightarrow 0} \left(\frac{\cos ax - \cos bx}{x^2} \right)$.
7. Show that f , given by $f(x) = \frac{x - |x|}{x}$ ($x \neq 0$), is continuous on $R - \{0\}$.
8. If $x = a \cos^3 t$, $y = a \sin^3 t$, find $\frac{dy}{dx}$.
9. Find Δy and dy for the function $y = x^2 + 2x$, when $x = 5$ and $\Delta x = -0.1$.
10. Show that the tangent at any point θ on the curve $x = c \sec \theta$, $y = c \tan \theta$ is $y \sin \theta = x - c \cos \theta$.

SECTION - B**5 × 4 = 20****SHORT ANSWER TYPE QUESTIONS**

Answer any FIVE questions. Each question carries 4 marks.

11. $A(4, 0)$, $B(-4, 0)$ are two points. Find the equation of locus of P , such that $|PA - PB| = 4$.
12. Find the transformed equation of $x^2 + 2\sqrt{3}xy - y^2 = 2a^2$, when the axes are rotated through an angle $\pi/6$.

13. Transform the equation $x/a + y/b = 1$ into normal form, where $a > 0, b > 0$. If the perpendicular distance of the straight line from the origin is p , deduce that

$$\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$$

14. If $x^y = e^{x-y}$, show that $\frac{dy}{dx} = \frac{\log x}{(1 + \log x)^2}$.

15. Find the derivative of $\tan^{-1} \sqrt{\frac{1 - \cos x}{1 + \cos x}}$ with respect to x .

16. A balloon is in the shape of an inverted cone surmounted by hemisphere. Diameter of the sphere is equal to the height of the cone. If h is the total height of the balloon, then how does the volume of the balloon changes with h ? What is the rate of change in volume, when $h = 9$ units?

17. If $u = \sin^{-1} \left(\frac{x+y}{\sqrt{x} + \sqrt{y}} \right)$, show that $x u_x + y u_y = \frac{1}{2} \tan u$.

SECTION - C

5 × 7 = 35

LONG ANSWER TYPE QUESTIONS

Answer any FIVE questions. Each question carries 7 marks.

18. Find the orthocentre of the triangle whose vertices are $(-2, -1)$, $(6, -1)$ and $(2, 5)$.
19. Prove that the area of the triangle formed by $ax^2 + 2hxy + by^2 = 0$ and $lx + my + n = 0$ is $\frac{n^2 \sqrt{h^2 - ab}}{|am^2 - 2hlm + bl^2|}$.
20. Find the angle between the lines joining the origin to the points of intersection of the curve $x^2 + 2xy + y^2 + 2x + 2y - 5 = 0$ and the line $3x - y + 1 = 0$.
21. Find the direction cosines (l, m, n) of the two lines which are connected by the relations $l + 5m + 3n = 0$ and $7l^2 + 5m^2 - 3n^2 = 0$.
22. Find the derivative of $(\sin x)^x + x^{\sin x}$ with respect to x .
23. If the tangent at any point on the curve $x^{2/3} + y^{2/3} = a^{2/3}$ intersects the coordinate axes at A, B ; then show that the length AB is constant.
24. Find two positive numbers, whose sum is 12 and the sum of whose squares is minimum.