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WINTER BREAK HOME WORK – 2025 - 26

CLASS-XI - SC (MATHS - 041)

STRAIGHT LINES

Q.1. Which of the following is true:

(a) Product of the slopes of two parallel lines is -1.
(b) Slopes of two perpendicular lines are always equal.
(c) Slope of the $x-axis$ is not defined.
(d) Product of the slopes of two perpendicular lines is always -1.

Q.2. The different forms of the equation of straight line are given below, which of the following is not correctly matched:

(a) Slope intercept form: $y = mx + c$ (b) Point - slope form: $(x - x_1) = m(y - y_1)$
(c) Intercept form: $\frac{x}{a} + \frac{y}{b} = 1$ (d) General form: $ax + by + c = 0$

Q.3. Straight line through the points $(3, x)$ and $(2, 7)$ is parallel to the line through the points $(-1, 4)$ and $(0, 6)$. Find the value of x.

Q.4. Find the equation of the straight line perpendicular to the line $x - 7y + 5 = 0$ and having x - intercept 3.

Q.5. If p is the length of perpendicular from the origin to the line whose intercepts on the axes are a and b, then show that $\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$.

CIRCLES

Q.1. Find the equation of the circle concentric with the circle $x^2 + y^2 - 8x + 6y - 5 = 0$ and passing through the point $(-2, -7)$.

Q.2. Find the equation of the circle with:
(i) Centre (-2, 3) and radius 4 (ii) Centre (a cos α, a sin α) and radius a.

Q.3. Find the centre and radius of each of the following circles:

(i) $(x - 1)^2 + y^2 = 4$ (ii) $x^2 + y^2 - 4x + 6y = 5$

Q.4. Find the equation of the circle whose centre is (1, 2) and which passes through the point (4, 6).

Q.5. Find the equation of the circle passing through the point of intersection of the lines $x + 3y = 0$ and $2x - 7y = 0$ and whose centre is the point of intersection of the lines $x + y + 1 = 0$ and $x - 2y + 4 = 0$.

Q.6. Find the equation of the circle which has its centre at the point (3, 4) and touches the straight line $5x + 12y - 1 = 0$.

Q.7. Find the equation of the circle which passes through the points (3, 7), (5, 5) and has its centre on line $x - 4y = 1$.

Q.8. Find the equation of the circle with the endpoints whose diameter are the centres of the circles $x^2 + y^2 + 6x - 14y - 1 = 0$ and $x^2 + y^2 - 4x + 10y - 2 = 0$.

PARABOLA

Q.1. Find the equation of the parabola whose focus is (2, 3) and the directrix is $x - 4y + 1 = 0$.

Q.2. Find the vertex, focus, axis, directrix and latus – rectum of the parabola: $2x^2 + 9y = 0$.

Q.3. Find the area of the triangle formed by the lines joining the vertex of the parabola $x^2 = 12y$ to the ends of its latus – rectum.

Q.4. At what point of the parabola $x^2 = 9y$ is the abscissa three times that of ordinate?

Q.5. If the points (0, 4) and (0, 2) are respectively the vertex and focus of a parabola, then find the equation of the parabola.

Q.6. What is the eccentricity of parabola: $x^2 = -16y$.

Q.7. If the parabola $y^2 = 4ax$ passes through the point (3, 2), then the length of its latus rectum.

ELLIPSE

Q.1. Find the eccentricity, coordinates of foci, length of the latus – rectum of the following ellipse: $4x^2 + 9y^2 = 1$

Q.2. Find the equation of the ellipse, whose length major axis is 20 and foci are (0, ±5).

Q.3. Find the equation to the ellipse (referred to its axes as the axes of x and y respectively) which passes through the point (-3, 1) and has eccentricity $\sqrt{(2/5)}$.

Q.4. Find the equation of the ellipse in the following cases:

(i) eccentricity e = ½ and foci (± 2, 0)

(ii) eccentricity e = 2/3 and length of latus – rectum = 5

(iii) eccentricity e = ½ and semi – major axis = 4

(iv) eccentricity e = ½ and major axis = 12

(v) The ellipse passes through (1, 4) and (- 6, 1)

Q.5. Find the equation of the ellipse in the standard form whose minor axis is equal to the distance between foci and whose latus – rectum is 10.

HYPERBOLA

Q.1. Find the equation of hyperbola lengths of whose transverse and conjugate axes are 3 and 4 respectively.

Q.2. Find the equation of the hyperbola whose foci are (0, ±13) and the conjugate axis is of the length 24.

Q.3. Find the eccentricity, coordinates of the foci, and length of the latus-rectum of the Hyperbola:

(i) $9x^2 – 16y^2 = 144$ (ii) $16x^2 – 9y^2 = -144$

Q.4. Find the equation of the hyperbola, referred to its principal axes as axes of coordinates, in the following cases:

(i) the distance between the foci = 16 and eccentricity = √2

(ii) conjugate axis is 5 and the distance between foci = 13

(iii) conjugate axis is 7 and passes through the point (3, -2)

THREE DIMENTIONAL GEOMETRY

Q.1. Name the octants in which the following points lie:

(i) (5,2,3) (ii) (-5,4.3) (iii) (4,-3,5)
(iv) (7,4,-3) (v) (-5,-4,7) (vi) (-5,-3,-2)
(vii) (2,-5,-7) (viii) (-7,2-5).

Q.2. Find the image of:

(i) (- 2,3,4) in the yz - plane. (ii) (- 5 ,4, -3) in the xz - plane.
(iii) (5 ,2-7) in the xy - plane. (iv) (- 5,0,3) in the xz-plane.
(v) (- 4,0,0) in the xy - plane.

Q.3. A cube of side 5 has one vertex at the point (1,0,-1), and the three edges from this vertex are, respectively, parallel to the negative x and y axes and positive z-axis. Find the coordinates of the other vertices of the cube.

Q.4. Planes are drawn parallel to the coordinate planes through the points (3, 0,-1) and (- 2, 5,4). Find the lengths of the edges of the parallelepiped so formed.

Q.5. Planes are drawn through the points (5,0,2) and (3,- 2 ,5) parallel to the coordinate planes. Find the lengths of the edges of the rectangular parallelopiped so formed.

Q.6. Find the distances of the point P (- 4,3,5) from the coordinate axes.

Q.7. The coordinates of a point are (3, - 2, 5). Write down the coordinates of seven points such that the absolute values of their coordinates are the same as those of the coordinates of the given point.

Q.8. Prove by using distance that the points P (1, 2, 3), Q (–1, –1, –1) and R (3, 5, 7) are collinear.

Q.9. Determine the point in XY–plane which is equidistant from three points A (2, 0, 3), B(0, 3, 2) and C (0, 0, 1).

Q.10. Find the coordinates of a point on Y–axis which is at a distance of $5\sqrt{2}$, from the point P (3, –2, 5).

Q.11. Show that the points A (0, 1, 2), B (2, –1, 3) and C(1, –3, 1) are vertices of an isosceles right–angled triangle.

Q.12. Find the locus of the point which is equidistant from the points A (0, 2, 3) and (2, – 2, 1).

Q.13. Prove that the point A (1, 3, 0), B (- 5, 5, 2), C (-9,-1, 2) and D (- 3, - 3,0) taken in order are the vertices of a parallelogram. Also, show that ABCD is not a rectangle.

LIMITS AND DERIVATIVES

Q.1. The value of $\lim_{x\to 0} \frac{x}{x}$ is:

(a) 0 (b) 1

(c) ∞ (d) Does not exist

Q.2. Derivative of a function $y = f(x)$ with respect to x at $x = a$ is:

(a) Slope of line parallel to $x - axis$ at the point $(a, f(a))$

(b) Slope of line parallel to $y - axis$ at the point $(a, f(a))$

(c) Slope of tangent to the curve $y = f(x)$ at the point $(a, f(a))$

(d) Slope of the line passing through origin and the point $(a, f(a))$

Q.3. Evaluate: $\lim_{x\to 0} \left(\frac{\sin 4x}{\sin 3x}\right)$

Q.4. Evaluate: If $\lim_{x\to 2} \left(\frac{x^n - 2^n}{x-2}\right) = \lim_{x\to 4} (5x^2 + 2x - 8)$ and $n \in N$, then find n.

Q.5. Evaluate: $\lim_{x\to 2} \frac{x^3 - 2^3}{x-2}$

Q.6. Evaluate: $\lim_{x\to \frac{\pi}{6}} \frac{\sqrt{3}\sin x - \cos x}{x - \frac{\pi}{6}}$

Q.7. Evaluate: $\lim_{x\to 2} \frac{x^2 - 5x + 6}{x^2 - 4}$

Q.8. Find the derivative of the following by using first principle

(i) $sinx$ (ii) $\frac{2x+1}{2x-1}$ (iii) $x^3 - 2$

Q.9. Find the derivative of the following with respect to x

(i) $\frac{x^{20}}{21} - \frac{1}{45x^{45}}$ (ii) $sinx + secx + tanx$ (iii) $\left(sin\frac{x}{2} + cos\frac{x}{2}\right)^2$ (iv) $\frac{1+sinx}{cosx}$

Q.10. Find the derivative of the following with respect to x

(i) $xsinx$ (ii) $(2x - 1)(3x + 2)$ (iii) $\frac{x^2-2}{x^2+2}$ (iv) $\frac{sinx}{1+cosx}$

Q.11. If $y = \frac{cosx+sinx}{cosx-sinx}$ then prove that $\frac{dy}{dx} = 1 + y^2$