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Coordinate Geometry Exercises

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Contents

***Abstract*—This book provides some exercises related to coordinate geometry. The content and exercises are based on NCERT textbooks from Class 6-12.**

1. Find the area of the region enclosed between the two circles: $\mathbf{x}^T\mathbf{x} = 4$ and $\left\|\mathbf{x} - \begin{pmatrix}2\\0\end{pmatrix}\right\| = 2$.
2. Find the equation of the circle with radius 5 whose centre lies on x-axis and passes through the point $\begin{pmatrix}2\\3\end{pmatrix}$.
3. Find the equation of the circle passing through $\begin{pmatrix}0\\0\end{pmatrix}$ and making intercepts a and b on the coordinate axes.
4. Find the equation of a circle with centre $\begin{pmatrix}2\\2\end{pmatrix}$ and passes through the point $\begin{pmatrix}4\\5\end{pmatrix}$.
5. Find the locus of all the unit vectors in the xy-plane.
6. Find the points on the curve $\mathbf{x}^T\mathbf{x} - 2\begin{pmatrix}1 & 0\end{pmatrix}\mathbf{x} - 3 = 0$ at which the tangents are parallel to the x-axis.
7. Find the area of the region in the first quadrant enclosed by x-axis, line $\begin{pmatrix}1 & -\sqrt{3}\end{pmatrix}\mathbf{x} = 0$ and the circle $\mathbf{x}^T\mathbf{x} = 4$.
8. Find the area lying in the first quadrant and bounded by the circle $\mathbf{x}^T\mathbf{x} = 4$ and the lines $x = 0$ and $x = 2$.
9. Find the area of the circle $4\mathbf{x}^T\mathbf{x} = 9$.
10. Find the area bounded by curves $\left\|\mathbf{x} - \begin{pmatrix}1\\0\end{pmatrix}\right\| = 1$ and $\|\mathbf{x}\| = 1$
11. Find the smaller area enclosed by the circle $\mathbf{x}^T\mathbf{x} = 4$ and the line $\begin{pmatrix}1 & 1\end{pmatrix}\mathbf{x} = 2$.
12. Find the slope of the tangent to the curve $y = \frac{x-1}{x-2}, x \neq 2$ at $x = 10$.
13. Find a point on the curve $y = (x-2)^2$ at which the tangent is parallel to the chord joining the points $\begin{pmatrix}2\\0\end{pmatrix}$ and $\begin{pmatrix}4\\4\end{pmatrix}$.
14. Find the equation of all lines having slope -1 that are tangents to the curve $\frac{1}{x-1}, x \neq 1$
15. Find the equation of all lines having slope 2 which are tangents to the curve $\frac{1}{x-3}, x \neq 3$.
16. Find points on the curve $\mathbf{x}^T\begin{pmatrix}\frac{1}{9} & 0\\0 & \frac{1}{16}\end{pmatrix}\mathbf{x} = 1$ at which tangents are
    a) parallel to x-axis
    b) parallel to y-axis.
17. Find the equations of the tangent and normal to the given curves at the indicated points: $y = x^2$ at $\begin{pmatrix}0\\0\end{pmatrix}$.

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18. Find the equation of the tangent line to the curve $y = x^2 - 2x + 7$
    a) parallel to the line $\begin{pmatrix}2 & -1\end{pmatrix}\mathbf{x} = -9$
    b) perpendicular to the line $\begin{pmatrix}-15 & 5\end{pmatrix}\mathbf{x} = 13$.
19. Find the equation of the tangent to the curve $y = \sqrt{3x-2}$ which is parallel to the line $\begin{pmatrix}4 & 2\end{pmatrix}\mathbf{x} + 5 = 0$.
20. Find the point at which the line $\begin{pmatrix}-1 & 1\end{pmatrix}\mathbf{x} = 1$ is a tangent to the curve $y^2 = 4x$.
21. The line $\begin{pmatrix}-m & 1\end{pmatrix}\mathbf{x} = 1$ is a tangent to the curve $y^2 = 4x$. Find the value of m.
22. Find the normal at the point $\begin{pmatrix}1\\1\end{pmatrix}$ on the curve $2y + x^2 = 3$
23. Find the normal to the curve $x^2 = 4y$ passing through $\begin{pmatrix}1\\2\end{pmatrix}$.
24. Find the area of the region bounded by the curve $y^2 = x$ and the lines $x = 1, x = 4$ and the x-axis in the first quadrant.
25. Find the area of the region bounded by $y^2 = 9x, x = 2, x = 4$ and the x-axis in the first quadrant.
26. Find the area of the region bounded by $x^2 = 4y, y = 2, y = 4$ and the y-axis in the first quadrant.
27. Find the area of the region bounded by the ellipse $\mathbf{x}^T\begin{pmatrix}\frac{1}{16} & 0\\0 & \frac{1}{9}\end{pmatrix}\mathbf{x} = 1$
28. Find the area of the region bounded by the ellipse $\mathbf{x}^T\begin{pmatrix}\frac{1}{4} & 0\\0 & \frac{1}{9}\end{pmatrix}\mathbf{x} = 1$
29. The area between $x = y^2$ and $x = 4$ is divided into two equal parts by the line $x = a$, find the value of a.
30. Find the area of the region bounded by the parabola $y = x^2$ and $y = |x|$.
31. Find the area bounded by the curve $x^2 = 4y$ and the line $\begin{pmatrix}1 & -1\end{pmatrix}\mathbf{x} = -2$.
32. Find the area of the region bounded by the curve $y^2 = 4x$ and the line $x = 3$.
33. Find the area of the region bounded by the curve $y^2 = x$, y-axis and the line $y = 3$.
34. Find the area of the region bounded by the two parabolas $y = x^2, y^2 = x$.
35. Find the area lying above x-axis and included between the circle $\mathbf{x}^T\mathbf{x} - 8\begin{pmatrix}1 & 0\end{pmatrix} = 0$ and inside of the parabola $y^2 = 4x$.
36. AOBA is the part of the ellipse $\mathbf{x}^T\begin{pmatrix}9 & 0\\0 & 1\end{pmatrix}\mathbf{x} = 36$ in the first quadrant such that $OA = 2$ and $OB = 6$. Find the area between the arc AB and the chord AB.
37. Find the area lying between the curves $y^2 = 4x$ and $y = 2x$.
38. Find the area of the region bounded by the curves $y = x^2 + 2, y = x, x = 0$ and $x = 3$.
39. Find the area under $y = x^2, x = 1, x = 2$ and x-axis.
40. Find the area between $y = x^2$ and $y = x$.
41. Find the area of the region lying in the first quadrant and bounded by $y = 4x^2, x = 0, y = 1$ and $y = 4$.
42. Find the area enclosed by the parabola $4y = 3x^2$ and the line $\begin{pmatrix}-3 & 2\end{pmatrix}\mathbf{x} = 12$.
43. Find the area of the smaller region bounded by the ellipse $\mathbf{x}^T\begin{pmatrix}\frac{1}{9} & 0\\0 & \frac{1}{4}\end{pmatrix}\mathbf{x} = 1$ and the line $\begin{pmatrix}\frac{1}{a} & \frac{1}{b}\end{pmatrix}\mathbf{x} = 1$
44. Find the area of the region enclosed by the parabola $x^2 = y$, the line $\begin{pmatrix}-1 & 1\end{pmatrix}\mathbf{x} = 2$ and the x-axis.
45. Find the area bounded by the curves
$$\left\{(x, y) : y > x^2, y = |x|\right\} \tag{45.1}$$
46. Find the area of the region
$$\left\{(x, y) : y^2 \le 4x, 4\mathbf{x}^T\mathbf{x} = 9\right\} \tag{46.1}$$
47. Find the area of the circle $\mathbf{x}^T\mathbf{x} = 16$ exterior to the parabola $y^2 = 6$.