



Attempt all questions before checking the answer key. Use standard conic equations. State centre/vertex, axis direction and relevant parameters.

A. Very short answers - 1 mark each

1. Identify the conic $y^2 = 12x$ and find its vertex.
2. Find the centre and radius of $(x - 2)^2 + (y + 1)^2 = 25$.
3. State the eccentricity range of an ellipse.
4. Find the foci of $x^2/25 + y^2/9 = 1$.
5. State the relation between a , b and c for $x^2/a^2 - y^2/b^2 = 1$.

B. Short answers / practice - 2 marks each

6. Find focus, directrix and latus-rectum length of $y^2 = 16x$.
7. Find the equation of a circle with centre $(-2, 3)$ and radius 4.
8. Find the vertices and eccentricity of $x^2/36 + y^2/20 = 1$.
9. Find the foci and eccentricity of $x^2/16 - y^2/9 = 1$.
10. Write the equation of a parabola with focus $(0, 3)$ and directrix $y = -3$.
11. Find focus of $x^2 = 8y$.
12. Find radius of $x^2 + y^2 = 49$.
13. Find eccentricity of $x^2/9 + y^2/4 = 1$.
14. Find centre of $x^2 + y^2 - 4x + 6y = 12$.
15. Find vertices of $y^2/16 - x^2/9 = 1$.
16. Is every circle an ellipse?
17. Find latus-rectum length for $y^2 = 20x$.
18. Write parabola with vertex origin, focus $(-2, 0)$.
19. Find minor-axis length of $x^2/36 + y^2/16 = 1$.
20. Find eccentricity of $x^2/9 - y^2/16 = 1$.

C. Short answers - 3 marks each

21. Find the equation of a circle whose diameter has endpoints $(1, 2)$ and $(7, 6)$.
22. Find the circle passing through $(1, 1)$, $(5, 1)$ and $(1, 5)$.

23. Find the ellipse centred at the origin with major axis along x , major-axis length 10 and focal distance 6.

24. Find the hyperbola centred at the origin with vertices $(\pm 3, 0)$ and foci $(\pm 5, 0)$, and its latus-rectum length.

25. Find the equation of the parabola with vertex at the origin and axis along $+x$ that passes through $(2, 4)$. Find its focus and directrix.

D. Long answers - 5 marks each

26. Derive $y^2 = 4ax$ from the focus-directrix definition of a parabola. Find the endpoints and length of its latus rectum.
27. Derive the standard ellipse equation from the constant sum of focal distances. Explain the relation $b^2 = a^2 - c^2$ and the meaning of eccentricity.
28. For $9x^2 + 25y^2 = 225$, find axes, vertices, foci, eccentricity and latus-rectum length. Sketch the ellipse to show relative dimensions.
29. For $16x^2 - 9y^2 = 144$, find vertices, foci, eccentricity and latus-rectum endpoints. Explain which axis contains the foci and sketch the branches.
30. A circle has its centre at the intersection of $x + y = 4$ and $x - y = 2$ and passes through $(1, 4)$. Find its equation, radius and intercepts on both axes, if real.

ANSWER KEY - Numerical / short answers

- 1) Parabola; vertex $(0, 0)$.
- 2) Centre $(2, -1)$; radius 5.
- 3) $0 \leq e < 1$, including the circle.
- 4) $(\pm 4, 0)$.
- 5) $c^2 = a^2 + b^2$.
- 6) Focus $(4, 0)$, directrix $x = -4$, length 16.
- 7) $(x + 2)^2 + (y - 3)^2 = 16$.
- 8) $(\pm 6, 0)$; $e = 2/3$.
- 9) $(\pm 5, 0)$; $e = 5/4$.
- 10) $x^2 = 12y$.
- 11) $(0, 2)$.
- 12) 7.
- 13) $\sqrt{5/3}$.
- 14) $(2, -3)$.
- 15) $(0, \pm 4)$.
- 16) Yes, with coincident foci and $e = 0$.
- 17) 20.
- 18) $y^2 = -8x$.
- 19) 8.
- 20) $5/3$.
- 21) $(x - 4)^2 + (y - 4)^2 = 13$.
- 22) $(x - 3)^2 + (y - 3)^2 = 8$.
- 23) $x^2/25 + y^2/16 = 1$.
- 24) $x^2/9 - y^2/16 = 1$; length $32/3$.
- 25) $y^2 = 8x$; $(2, 0)$; $x = -2$.
- 26) Endpoints $(a, \pm 2a)$; length $4a$.
- 28) Major/minor lengths 10, 6; vertices $(\pm 5, 0)$; foci $(\pm 4, 0)$; $e = 4/5$; latus rectum $18/5$.
- 29) Vertices $(\pm 3, 0)$; foci $(\pm 5, 0)$; $e = 5/3$; latus endpoints $(\pm 5, \pm 16/3)$.
- 30) $(x - 3)^2 + (y - 1)^2 = 13$; $r = \sqrt{13}$; x intercepts $3 \pm 2\sqrt{3}$; y intercepts $3, -1$.