

Conic Sections — Assignment 2

Class 11 Maths · Higher-difficulty challenge set + integrated problems · Answer key included · Narayan Gurukul Academy

Instructions: (1) Attempt all questions; start with the topic-wise challenge set, then attempt the integrated (multi-topic) problems.
(2) Give all answers with correct SI units. $g = 10 \text{ m/s}^2$ unless stated.
(3) A final answer key is provided at the end — try the full set before checking it.

Part A — Topic-wise challenge questions

Circles

1. Find the centre and radius of the circle $x^2 + y^2 - 6x + 4y - 12 = 0$.
2. Find the equation of the circle with centre $(2, 3)$ and radius 4.
3. Find the equation of the circle passing through the points $(0, 0)$, $(a, 0)$ and $(0, b)$.

Parabola

1. Find the focus, axis and latus rectum of the parabola $y^2 = 12x$.
2. Find the equation of the parabola with focus $(2, 0)$ and directrix $x = -2$.
3. Find the focus, directrix, axis and length of the latus rectum of the parabola $y^2 = 16x$.

Ellipse

1. Find the eccentricity of the ellipse $x^2/25 + y^2/9 = 1$.
2. Find the foci of the ellipse $x^2/16 + y^2/9 = 1$.
3. Find the eccentricity, foci and length of the latus rectum of the ellipse $x^2/36 + y^2/16 = 1$.

Hyperbola

1. Find the eccentricity of the hyperbola $x^2/9 - y^2/16 = 1$.
2. Find the foci of the hyperbola $x^2/25 - y^2/24 = 1$.
3. Find the eccentricity, foci and length of the latus rectum of the hyperbola $x^2/16 - y^2/9 = 1$.

Identifying Conics by Eccentricity

1. Identify the conic: $4x^2 + 9y^2 = 36$.
2. Identify the conic: $9x^2 - 16y^2 = 144$.
3. Determine the eccentricity of each of the conics $x^2/16 + y^2/9 = 1$ and $x^2/9 - y^2/16 = 1$ and classify them.

Parametric Equations of Conics

1. Find the parametric equations of the circle $x^2 + y^2 = 25$.
2. Find the point on the parabola $y^2 = 8x$ at $t = 2$.
3. Find the parametric equations of the ellipse $x^2/25 + y^2/9 = 1$ and the hyperbola $x^2/16 - y^2/9 = 1$.

Part B — Integrated problems (multi-topic)

1. Find the centre and radius of the circle $x^2 + y^2 - 6x + 4y - 12 = 0$.
2. Find the focus and latus rectum of the parabola $y^2 = 12x$.
3. Find the eccentricity and foci of the ellipse $x^2/25 + y^2/9 = 1$.
4. Find the eccentricity and foci of the hyperbola $x^2/9 - y^2/16 = 1$.
5. Write the parametric form of the parabola $y^2 = 4ax$.

Answer Key**Circles**

$(x-3)^2 + (y+2)^2 = 25$, centre $(3, -2)$, radius 5. $(x-2)^2 + (y-3)^2 = 16$. $x^2 + y^2 - ax - by = 0$.

Parabola

$y^2 = 12x$: focus $(3, 0)$, axis $y = 0$, latus rectum 12. Focus $(2, 0)$, directrix $x = -2$ $y^2 = 8x$. $y^2 = 16x$: focus $(4, 0)$, directrix $x = -4$, axis $y = 0$, latus rectum 16.

Ellipse

$x^2/25 + y^2/9$: $e = 4/5$. $x^2/16 + y^2/9$: foci $(\pm\sqrt{7}, 0)$. $x^2/36 + y^2/16$: $e = \sqrt{20}/6 = \sqrt{5}/3$, foci $(\pm 2\sqrt{5}, 0)$, latus rectum $2b^2/a = 32/6 = 16/3$.

Hyperbola

$x^2/9 - y^2/16$: $e = 5/3$. $x^2/25 - y^2/24$: foci $(\pm 7, 0)$. $x^2/16 - y^2/9$: $e = 5/4$, foci $(\pm 5, 0)$, latus rectum $2b^2/a = 18/4 = 9/2$.

Identifying Conics by Eccentricity

$4x^2 + 9y^2 = 36$ $x^2/9 + y^2/4 = 1$, ellipse. $9x^2 - 16y^2 = 144$ $x^2/16 - y^2/9 = 1$, hyperbola. $x^2/16 + y^2/9$: $e = \sqrt{7}/4$ (ellipse); $x^2/9 - y^2/16$: $e = 5/3$ (hyperbola).

Parametric Equations of Conics

Circle: $(5 \cos \theta, 5 \sin \theta)$. Parabola at $t = 2$: $(8, 8)$. Ellipse: $(5 \cos \theta, 3 \sin \theta)$; hyperbola: $(4 \sec \theta, 3 \tan \theta)$.

Integrated problems

1: centre $(3, -2)$, $r = 5$. 2: focus $(3, 0)$, latus rectum 12. 3: $e = 4/5$, foci $(\pm 4, 0)$. 4: $e = 5/3$, foci $(\pm 5, 0)$. 5: $(at^2, 2at)$.