

Conic Sections and Parametric Equations: math practice, Grade 12 – download the PDF

24 problems graded by difficulty (★ easy, ★★ medium, ★★★ hard). Try first, without looking at the solutions!

1 Center and radius

★ ★ ★

Give the center and the radius of the circle $(x - 4)^2 + (y + 7)^2 = 49$.

2 Writing a circle equation

★ ★ ★

Write the equation of the circle with center $(-2, 5)$ and radius 3.

3 A simple parabola

★ ★ ★

For the parabola $x^2 = 8y$, find the vertex, the focus and the directrix.

4 Vertices of an ellipse

★ ★ ★

For $\frac{x^2}{49} + \frac{y^2}{25} = 1$, give the vertices, the co-vertices and the value of c .

5 Hyperbola features



For $\frac{x^2}{9} - \frac{y^2}{16} = 1$, find the vertices, the foci and the asymptotes.

6 Name that conic



Identify each curve: (a) $x^2 + y^2 = 36$; (b) $4x^2 + 9y^2 = 36$; (c) $y^2 - x^2 = 1$; (d) $y = 2x^2$.

7 A table of points



A curve is given by $x = t + 2$, $y = 3t - 1$. Complete the points for $t = 0, 1, 2, 3$, then eliminate t .

8 Completing the square



Find the center and radius of $x^2 + y^2 + 8x - 6y + 9 = 0$.

9 Circle through a point



A circle has center $(1, 2)$ and passes through $(4, 6)$. Find its equation in standard and general form.

10 From focus and directrix



A parabola has focus $(0, 5)$ and directrix $y = -5$. Write its equation and check that $(10, 5)$ is on it.

11 Satellite dish



A dish is 10 ft (about 3.05 m) across and 2 ft deep. Its cross-section is a parabola with the vertex at the origin opening upward. How far above the vertex is the receiver, which sits at the focus?

12 Ellipse from foci and vertices



An ellipse has foci $(\pm 3, 0)$ and vertices $(\pm 5, 0)$. Find its equation and its eccentricity.

13 Hyperbola from foci and vertices



A hyperbola has vertices $(\pm 6, 0)$ and foci $(\pm 10, 0)$. Find its equation, its asymptotes and its eccentricity.

14 Eliminating by substitution



Eliminate t from $x = t - 3$, $y = t^2 + 2t$ and name the curve.

15 Trigonometric elimination



Eliminate t from $x = 4 \cos t$, $y = 3 \sin t$, $0 \leq t \leq 2\pi$, and describe the curve.

16 Find the eccentricity first



An ellipse centered at the origin has $a = 10$ and $e = 0.6$. Find c , b and the equation (long axis horizontal).

17 An ellipse in general form

★★★

Write $4x^2 + 9y^2 - 16x + 18y - 11 = 0$ in standard form. Give the center, a , b , the foci and the eccentricity.

18 A vertical hyperbola

★★★

Analyze $9y^2 - 4x^2 - 36y - 8x - 4 = 0$: standard form, center, vertices, foci, asymptotes.

19 A sideways parabola

★★★

Write $y^2 - 6y - 8x + 25 = 0$ as $(y - k)^2 = 4p(x - h)$ and give the vertex, focus and directrix.

20 A planet's orbit

★★★

A planet's orbit is an ellipse with the star at one focus. Its closest distance to the star is 90 million miles and its farthest is 150 million miles (about 145 and 241 million km). Find a , c , the eccentricity and b .

21 Line and circle

★★★

Find the intersection points of the circle $x^2 + y^2 = 25$ and the line $y = x + 1$.

22 Projectile path

★★★

A ball follows $x = 30t$, $y = 5 + 40t - 16t^2$ (feet, seconds). (a) Eliminate t . (b) Find the maximum height. (c) How far from the thrower does it land? Round to 0.1 ft.

23 Only part of a curve



A point moves with $x = \cos t$, $y = \sin^2 t$. Eliminate t and describe exactly which part of the curve is traced.

24 A hyperbola with sec and tan



Show that $x = 2 \sec t$, $y = 3 \tan t$ lies on a hyperbola, and find its asymptotes.



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