LESSON MAKER PRO

Conic Map Quest

Read graphs, plot key points, and recognize conics.

HIGH SCHOOL · PC.F.D.31

PC.F.D.31 "Graph conic sections from second-degree equations, extending from circles and parabolas to ellipses and hyperbolas, using technology to discover patterns. a. Graph conic sections given their standard form. b..."

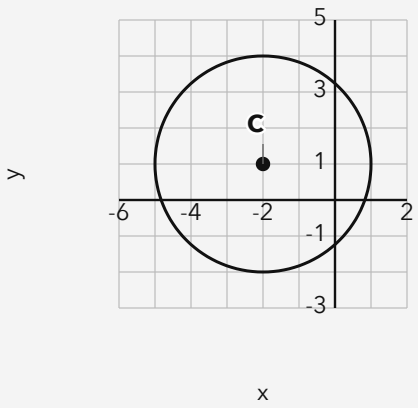
NAME _____ DATE _____

SPOT THE PATTERN

In a general-form equation, two squared variables with equal positive coefficients suggest a circle. Unequal positive coefficients suggest an ellipse, opposite signs suggest a hyperbola, and only one squared variable suggests a parabola. In standard form, use the center and the distances shown by the denominators to locate key points on a graph.

WORKED EXAMPLE

Read the circle on the grid. Write its equation in standard form.

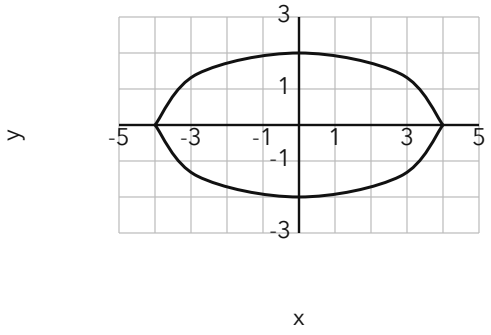


1. Read the center: C = (-2, 1).
2. Count 3 units from C to the circle, so the radius is 3.
3. Use $(x - h)^2 + (y - k)^2 = r^2$.

Answer: $(x + 2)^2 + (y - 1)^2 = 9$

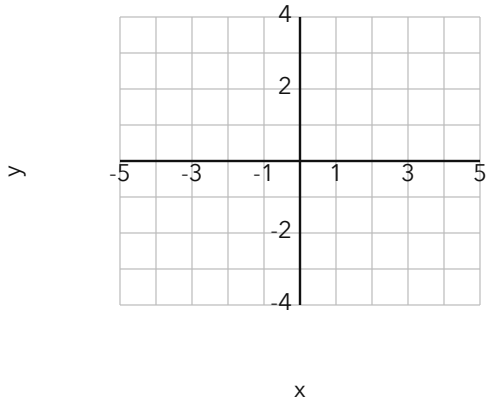
PRACTICE 6 problems

1 Read the ellipse on the grid. Write its equation in standard form.



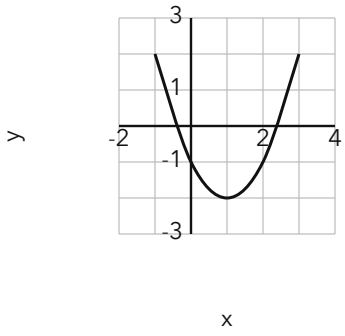
ANSWER _____

2 For $x^2/9 - y^2/4 = 1$, mark both vertices on the grid. Do the branches open left and right or up and down?



ANSWER _____

3 Read the parabola on the grid. Give its vertex and axis of symmetry.



ANSWER _____

4 Identify the conic: $x^2 + y^2 - 6x + 8y + 9 = 0$.

ANSWER _____

5 Identify the conic: $9x^2 + 4y^2 - 36x + 8y + 4 = 0$.

ANSWER _____

6 Identify the conic: $y^2 - x^2 + 6x + 4y - 6 = 0$.

ANSWER _____

APPLY IT Show your work

1 A concert app models the edge of a spotlight on a wall with $(x - 6)^2/36 + (y - 4)^2/9 = 1$. Each coordinate unit represents one foot. Find the center, full width, and full height of the lit area.

WORK SPACE

ANSWER _____

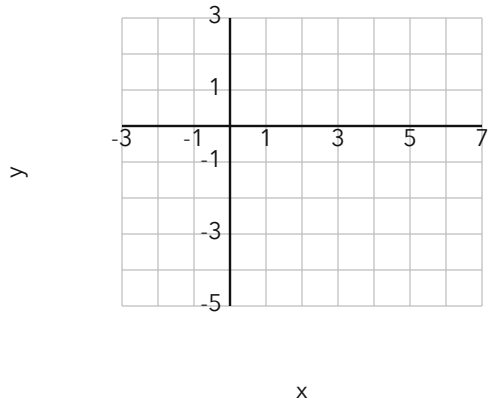
2 A game designer models the edges of a two-part portal with $(y - 1)^2/16 - (x + 2)^2/9 = 1$. Find the vertex of each branch. Do the branches open up and down or left and right?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Rewrite $4x^2 - 9y^2 - 16x - 18y - 29 = 0$ in standard form. Identify the conic, then mark its center and vertices on the grid.



WORK SPACE AND ANSWER

Conic Map Quest

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Read the ellipse on the grid. Write its equation in standard form.	**$x^2/16 + y^2/4 = 1$**
2	For $x^2/9 - y^2/4 = 1$, mark both vertices on the grid. Do the branches open left and right or up and down?	**Vertices: (-3, 0) and (3, 0). The branches open left and right.**
3	Read the parabola on the grid. Give its vertex and axis of symmetry.	**Vertex: (1, -2). Axis of symmetry: x = 1.**
4	Identify the conic: $x^2 + y^2 - 6x + 8y + 9 = 0$.	**Circle**
5	Identify the conic: $9x^2 + 4y^2 - 36x + 8y + 4 = 0$.	**Ellipse**
6	Identify the conic: $y^2 - x^2 + 6x + 4y - 6 = 0$.	**Hyperbola**

PART 2 · APPLY IT

1. **Center: (6, 4). Width: 12 feet. Height: 6 feet.** The center is (6, 4). The horizontal and vertical distances from the center to the edge are 6 and 3 feet, so double each for the full dimensions.
2. **Vertices: (-2, -3) and (-2, 5). The branches open up and down.** The center is (-2, 1), and the positive y term shows that the branches open vertically. Move 4 units down and up from the center to find the vertices.

CHALLENGE

$(x - 2)^2/9 - (y + 1)^2/4 = 1$; hyperbola. Center: (2, -1). Vertices: (-1, -1) and (5, -1).

Accept vertices in either order. For the challenge, completing the squares gives $4(x - 2)^2 - 9(y + 1)^2 = 36$.