LESSON MAKER PRO

Conic Sketch Lab

Find the center, mark key points, and sketch the curve.

HIGH SCHOOL · PC.F.D.31.a

PC.F.D.31.a "Graph conic sections given their standard form."

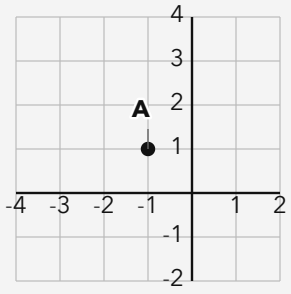
NAME _____ DATE _____

START AT THE CENTER

In $(x - h)^2 + (y - k)^2 = r^2$, the circle has center (h, k) and radius r. In an ellipse, the denominators under the squared terms give the squares of its horizontal and vertical radii. Mark the center and four points along those directions, then sketch a smooth curve.

WORKED EXAMPLE

A is the center of $(x + 1)^2 + (y - 1)^2 = 4$. Graph the circle on the grid.



1. The radius is sqrt(4) = 2.
2. From A, mark points 2 units left, right, up, and down.
3. Sketch a circle through the four points.

Answer: Center (-1, 1); circle through (-3, 1), (1, 1), (-1, 3), and (-1, -1).

PRACTICE 4 problems

1 Graph $(x + 3)^2 + (y - 2)^2 = 16$. Mark the center and four points on the circle.

ANSWER _____

2 Graph $x^2 + (y + 4)^2 = 25$. Mark the center and four points on the circle.

ANSWER _____

3 Graph $x^2/25 + y^2/9 = 1$. Mark the center and four endpoints of the ellipse's axes.

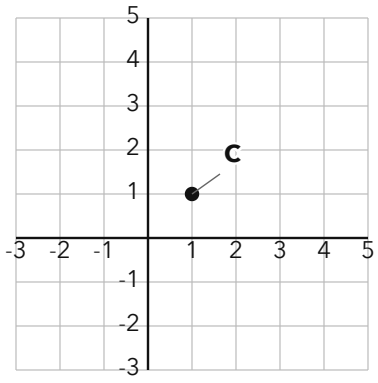
ANSWER _____

4 Graph $(x - 3)^2/16 + (y + 1)^2/36 = 1$. Mark the center and four endpoints of the ellipse's axes.

ANSWER _____

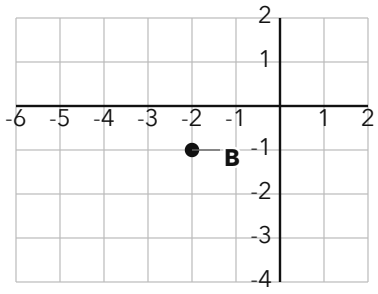
APPLY IT Show your work

1 An app places a round profile icon at C. Its edge is 3 grid units from C. Graph its outline on the grid and write its equation.



ANSWER _____

2 A design app places an oval badge at B. Its edge is 3 grid units left and right of B, and 2 units above and below B. Graph its outline and write its equation.



ANSWER _____

CHALLENGE One step up

Graph $(x + 2)^2/25 + (y - 3)^2/16 = 1$. Mark its center, four axis endpoints, and both foci. For an ellipse, $c^2 = a^2 - b^2$, where a and b are the longer and shorter radii.

WORK SPACE AND ANSWER

Conic Sketch Lab

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Graph $(x + 3)^2 + (y - 2)^2 = 16$. Mark the center and four points on the circle.	**Center (-3, 2); circle through (-7, 2), (1, 2), (-3, 6), and (-3, -2).**
2	Graph $x^2 + (y + 4)^2 = 25$. Mark the center and four points on the circle.	**Center (0, -4); circle through (-5, -4), (5, -4), (0, 1), and (0, -9).**
3	Graph $x^2/25 + y^2/9 = 1$. Mark the center and four endpoints of the ellipse's axes.	**Center (0, 0); ellipse through (-5, 0), (5, 0), (0, -3), and (0, 3).**
4	Graph $(x - 3)^2/16 + (y + 1)^2/36 = 1$. Mark the center and four endpoints of the ellipse's axes.	**Center (3, -1); ellipse through (-1, -1), (7, -1), (3, -7), and (3, 5).**

PART 2 · APPLY IT

1. **$(x - 1)^2 + (y - 1)^2 = 9$; circle through (-2, 1), (4, 1), (1, -2), and (1, 4).** Read C as (1, 1). Use radius 3 to write the equation and locate four points on the outline.
2. **$(x + 2)^2/9 + (y + 1)^2/4 = 1$; ellipse through (-5, -1), (1, -1), (-2, -3), and (-2, 1).** Read B as (-2, -1). Square the horizontal radius 3 and vertical radius 2 for the denominators, then plot the four endpoints.

CHALLENGE

Center (-2, 3); axis endpoints (-7, 3), (3, 3), (-2, -1), and (-2, 7). Since $c^2 = 25 - 16 = 9$, the foci are (-5, 3) and (1, 3).

Accept correctly shaped sketches passing through the listed points. The challenge ellipse is wider than it is tall, so its foci lie on the horizontal axis.