Calculus 1

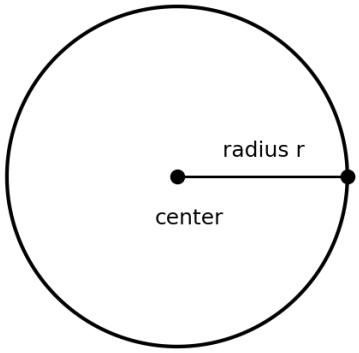
Conic Sections 2 Circles and Ellipses

Name:

Circle Notes

A circle is the set of all points that are the same distance from a fixed point called the .

That equal distance is the .



Standard Form

For a circle with center (h, k) and radius r:

$$(x \quad)^2 + (y \quad)^2 =$$

- The right side is r². Take the square root of the right side to find r.
- In the equation, the signs inside the parentheses are opposite the signs of the center coordinates.

Check for Understanding

For (x − 2)² + (y + 3)² = 16, the center is (,) and the radius is .

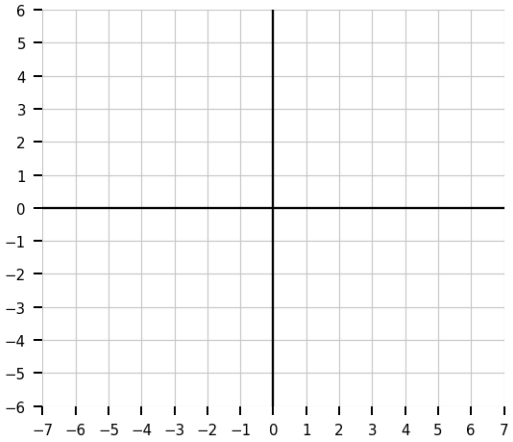
Write the equation of a circle with center (−1, 4) and radius 3.

$$(x \quad)^2 + (y \quad)^2 =$$

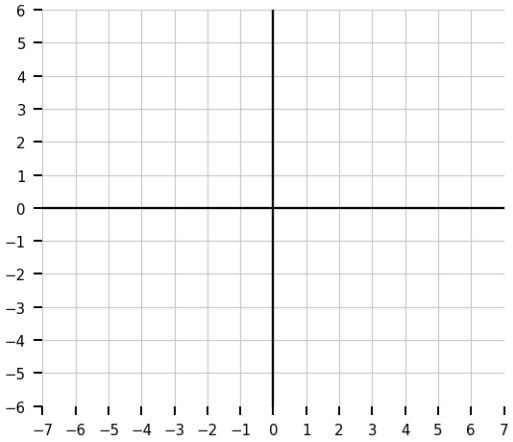
Circle Class Work

Use the notes above. Show the information you use before graphing.

1. For $(x - 2)^2 + (y + 1)^2 = 9$, identify the center and radius. Then sketch the circle.



2. For $(x + 1)^2 + (y - 2)^2 = 16$, identify the center and radius. Then sketch the circle.



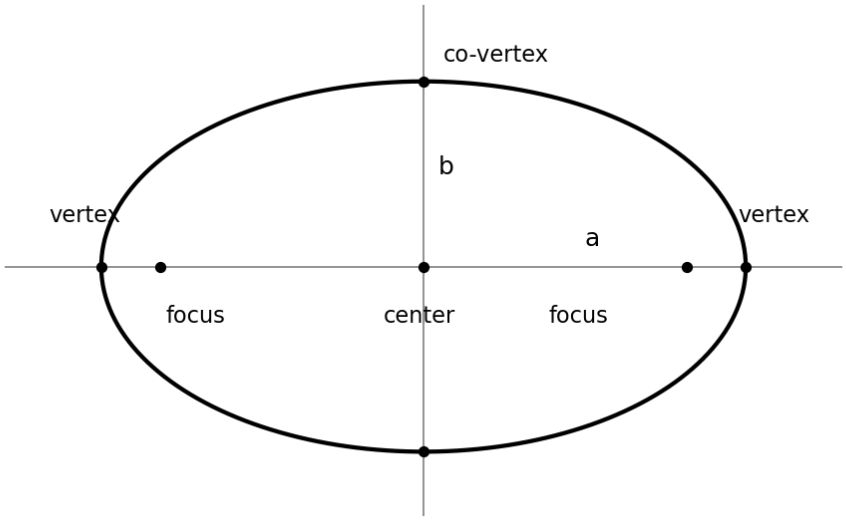
3. Write the equation of the circle with center $(3, -2)$ and radius 5.

4. Write the equation of the circle with center $(-4, 1)$ and radius 2.

Ellipse Notes

An ellipse is the set of all points for which the sum of the distances to two fixed points is constant.

The two fixed points are called the .



- The center is the midpoint of the ellipse.
- Vertices lie on the major axis, the longer direction.
- Co-vertices lie on the minor axis, the shorter direction.
- a is the center-to-vertex distance; b is the center-to-co-vertex distance.
- The full lengths of the axes are 2a and 2b.

Ellipse Notes

Standard Forms

Horizontal major axis:

$$(x-h)^2 \quad + (y-k)^2 \quad = 1$$

Vertical major axis:

$$(x-h)^2 \quad + (y-k)^2 \quad = 1$$

- The larger denominator is a^2 and shows the major-axis direction.
- The center is (h, k).

Foci

$$c^2 = \quad -$$

For a horizontal ellipse, the foci are (h c, k).

For a vertical ellipse, the foci are (h, k c).

- The foci are on the major axis, between the center and the vertices.

When an Equation Is Not in Standard Form

- Group the x-terms and y-terms. Factor first if needed.
- To complete $u^2 + Bu$, add $(B/2)^2$ to that group and keep the equation balanced.
- Rewrite each group as a square, then divide so the right side is 1.

Check for Understanding

For $(x-2)^2/25 + (y+1)^2/9 = 1$, the center is (,).

The major axis is . The vertices are (,) and (,).

Find c and write the foci:

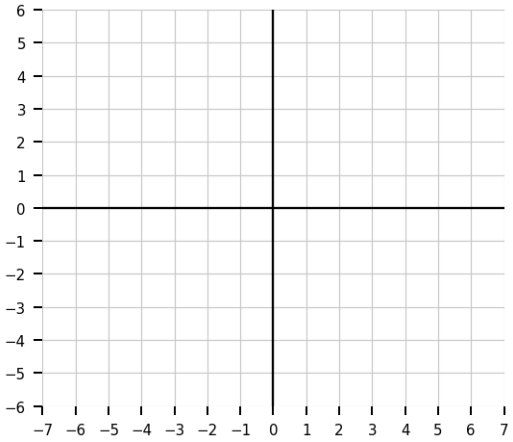
$$c^2 = \quad - \quad = \quad ; \quad c =$$

foci: (,) and (,)

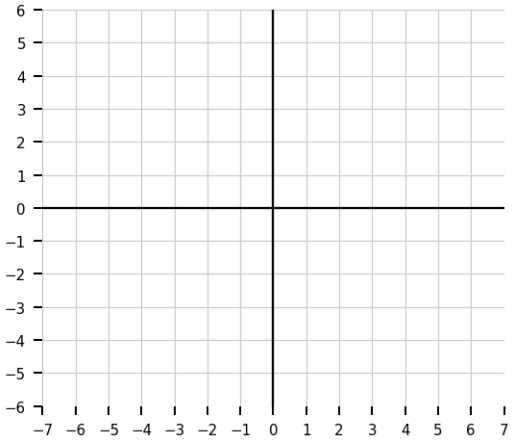
Ellipse Class Work

Use a, b, and c carefully. For every graph, label the center, vertices, co-vertices, and foci.

1. For $x^2/25 + y^2/9 = 1$, find the center, a, b, vertices, and co-vertices. Then sketch the ellipse.

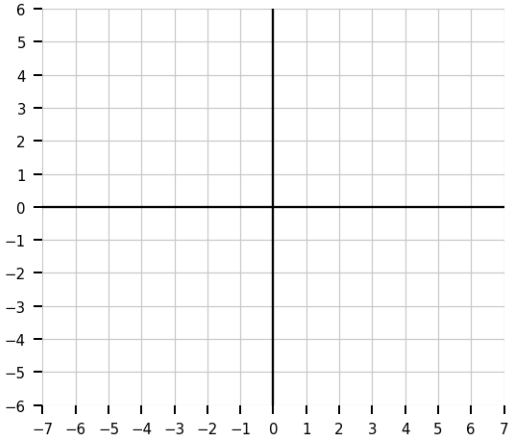


2. For $(x - 1)^2/9 + (y + 1)^2/25 = 1$, find the center, major-axis direction, vertices, and co-vertices. Then sketch.



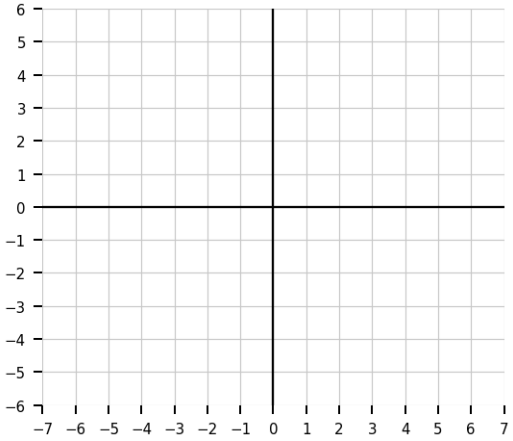
Ellipse Class Work

3. For $(x-1)^2/25 + (y+2)^2/9 = 1$, find c and the foci. Then sketch the ellipse.



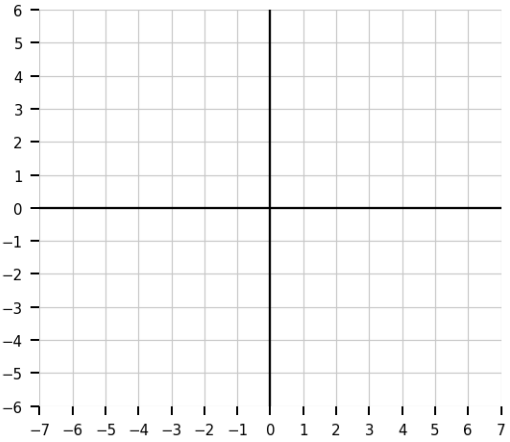
4. An ellipse has center (0, 0), vertices (0, ±5), and co-vertices (±3, 0). Write its equation.

5. For $(x+2)^2/25 + (y-1)^2/16 = 1$, find the center, vertices, co-vertices, and foci. Then sketch.



Ellipse Class Work

6. For $(x-1)^2/16 + (y+2)^2/25 = 1$, find the center, vertices, co-vertices, and foci. Then sketch.



7. Rewrite $x^2 + y^2 - 4x + 2y - 4 = 0$ in standard form. Identify the conic, center, and radius.

8. Rewrite $4x^2 + 9y^2 - 8x + 18y - 23 = 0$ in standard form. Identify the center and vertices.

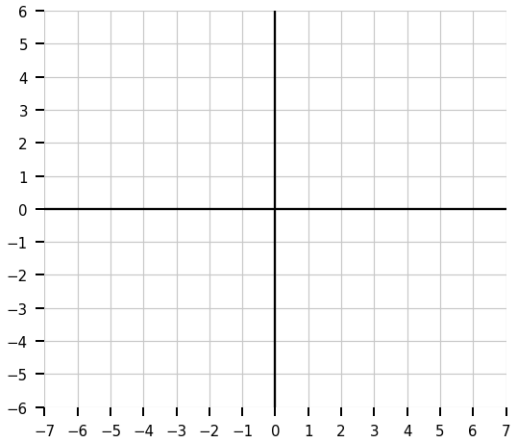
9. Rewrite $4x^2 + 9y^2 + 16x - 36y - 56 = 0$ in standard form. Identify the center, vertices, co-vertices, and foci.

Homework

Complete each problem. If you need more room, continue on the back of this packet.

Circle Practice

1. For $(x + 3)^2 + (y - 1)^2 = 25$, identify the center and radius. Then sketch the circle.



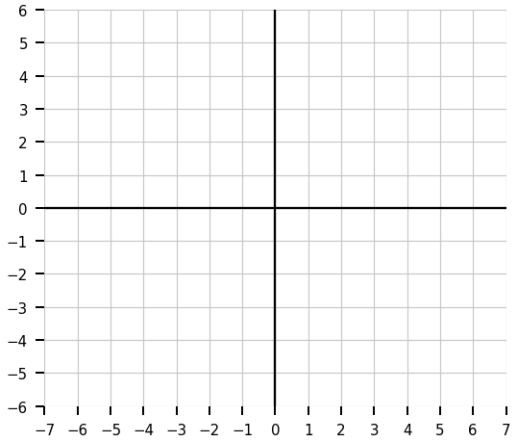
2. Write the equation of a circle with center $(-2, 5)$ and radius 4.

Ellipse Practice

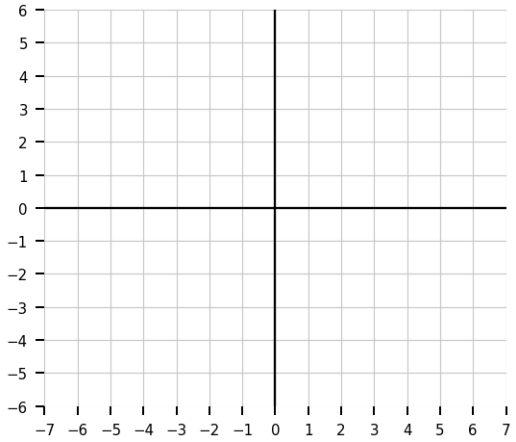
3. For $(x + 1)^2/25 + (y - 2)^2/16 = 1$, find the center, vertices, co-vertices, and foci.

Homework

4. For $(x-3)^2/9 + (y+2)^2/36 = 1$, find the center, major-axis direction, vertices, co-vertices, and foci. Then sketch.



5. For $(x+2)^2/49 + (y-1)^2/25 = 1$, find the center, vertices, co-vertices, and foci. Then sketch.



Homework

6. An ellipse has center (2, −1), horizontal major axis, a = 6, and b = 4. Write its equation and find its foci.

7. An ellipse has center (−3, 2), vertical major axis, a = 5, and b = 3. Write its equation and find its foci.

8. Rewrite $x^2 + 4y^2 + 6x - 16y - 3 = 0$ in standard form. Identify the conic and its key features.

9. Rewrite $9x^2 + 4y^2 - 54x + 8y + 149 = 0$ in standard form. Identify the center, vertices, co-vertices, and foci.

10. Create one circle equation and one ellipse equation. For each, list the center and all needed key features.