

LESSON
10.7**Study Guide**

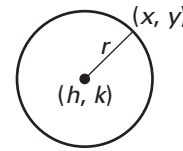
For use with pages 699–705

GOAL Write equations of circles in the coordinate plane.**Vocabulary**

You can write the equation of any circle if you know its radius and the coordinates of its center. Suppose a circle has radius r and center (h, k) . Let (x, y) be a point on the circle. The distance between (x, y) and (h, k) is r , so by the Distance Formula

$$\sqrt{(x - h)^2 + (y - k)^2} = r.$$

Standard Equation of a Circle: The standard equation of a circle with center (h, k) and radius r is: $(x - h)^2 + (y - k)^2 = r^2$

**EXAMPLE 1** Write an equation of a circle

Write the equation of the circle shown.

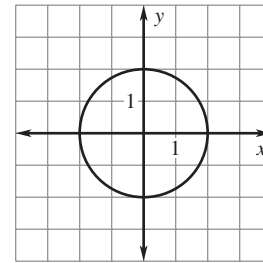
Solution

The radius is 2 and the center is at the origin.

$$x^2 + y^2 = r^2$$

$$x^2 + y^2 = 2^2$$

$$x^2 + y^2 = 4$$

The equation of the circle is $x^2 + y^2 = 4$.**EXAMPLE 2** Write the standard equation of a circleWrite the standard equation of a circle with center $(2, 0)$ and radius 3.3 .**Solution**

$$(x - h)^2 + (y - k)^2 = r^2$$

$$(x - 2)^2 + (y - 0)^2 = 3.3^2$$

$$(x - 2)^2 + y^2 = 10.89^2$$

Exercises for Examples 1 and 2

Write the standard equation of the circle with the given center and radius.

- Center $(0, 0)$, radius 2.8
- Center $(-3, 4)$, radius 5
- Center $(0, -2)$, radius 6
- Center $(-4, -1)$, radius 4.6

LESSON
10.7**Study Guide** *continued*
For use with pages 699–705**EXAMPLE 3** Write the standard equation of a circle

The point $(1, -3)$ is on a circle with center $(-1, -1)$. Write the standard equation of the circle.

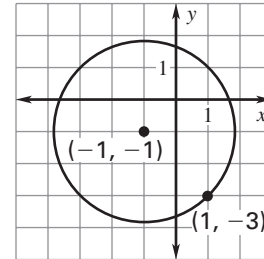
Solution

To write the standard equation, you need to know the values of h , k , and r . To find r , find the distance between the center and the point $(1, -3)$ on the circle.

$$\begin{aligned} r &= \sqrt{(-1 - 1)^2 + (-1 - (-3))^2} \\ &= \sqrt{(-2)^2 + 2^2} \\ &= 2\sqrt{2} \end{aligned}$$

Substitute $(h, k) = (-1, -1)$ and $r = 2\sqrt{2}$ into the standard equation of a circle.

$$\begin{aligned} (x - h)^2 + (y - k)^2 &= r^2 \\ (x - (-1))^2 + (y - (-1))^2 &= (2\sqrt{2})^2 \\ (x + 1)^2 + (y + 1)^2 &= 8 \end{aligned}$$

**Exercises for Example 3**

- The point $(-3, 1)$ is on a circle whose center is $(2, 3)$. Write the standard equation of the circle.
- The point $(0, 6)$ is on a circle whose center is $(-2, -1)$. Write the standard equation of the circle.

EXAMPLE 4 Graph a circle

The equation of a circle is $(x + 3)^2 + (y - 2)^2 = 9$. Graph the circle.

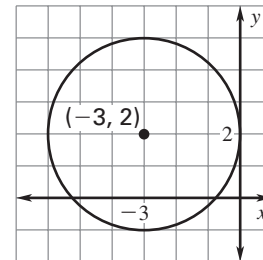
Solution

Rewrite the equation to find the center and radius.

$$\begin{aligned} (x + 3)^2 + (y - 2)^2 &= 9 \\ (x - (-3))^2 + (y - 2)^2 &= 3^2 \end{aligned}$$

The center is $(-3, 2)$ and the radius is 3.

Use a compass to graph the circle.

**Exercises for Example 4**

- The equation of a circle is $(x - 2)^2 + (y - 4)^2 = 25$. Graph the circle.
- The equation of a circle is $(x + 6)^2 + (y + 5)^2 = 100$. Graph the circle.