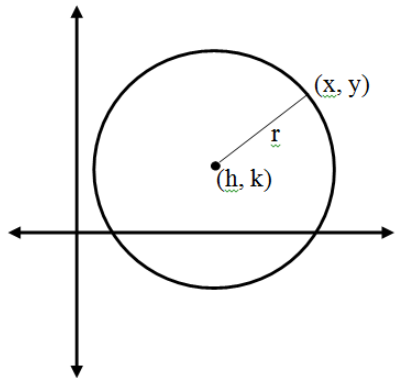


## 12.5 Circles in the Coordinate Plane

Learning Target: To write an equation of a circle & to find the center/radius of a circle.



The distance from the center to a point on the circle can be found using the distance formula:

Distance from  $(x, y)$  to  $(h, k)$  is:

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

This gives us the general formula for the equation of a circle.

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

Center:  $(h, k)$  Radius:  $r$

Ex 1: Find the equation of a circle whose center is  $(2, 7)$  and has a radius of 9.

$h$   $k$

$r$

$$(x-2)^2 + (y-7)^2 = 9^2$$

$$(x-2)^2 + (y-7)^2 = 81$$

Ex 2: Find the center and radius of

$$(x+3)^2 + (y-2)^2 = 200.$$

↑

Opp of 3

center:  $(-3, 2)$  radius =  $\sqrt{200}$

$$r = \sqrt{2 \cdot 100}$$

$$r = 10\sqrt{2}$$

Ex 3: Write an equation for the circle containing a center of  $(7, 5)$  and a point  $(3, -2)$ .

$h$   $k$

$x$   $y$

1st: Find length of radius!

$$r = \sqrt{(3-7)^2 + (-2-5)^2}$$

$$= \sqrt{(-4)^2 + (-7)^2}$$

$$= \sqrt{16 + 49}$$

$$= \sqrt{65}$$

$$r = \sqrt{65}$$

center

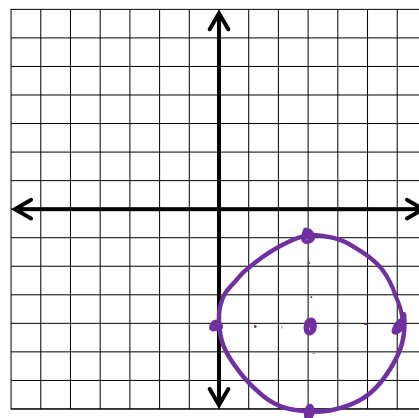
$(7, 5)$

square!

2nd:

$$(x-7)^2 + (y-5)^2 = 65$$

Ex 4: Graph:  $(x-3)^2 + (y+4)^2 = 9$ .



center:  $(3, -4)$

radius =  $\sqrt{9} = 3$

## Now you try!

1. Find the equation of a circle whose center is  $(3, 5)$  and the radius is 6.  $r^2 = 6^2 = 36$

$$(x-3)^2 + (y-5)^2 = 36$$

2. Find the equation of a circle whose center is  $(-2, -1)$  and the radius is  $\sqrt{2}$   $r^2 = \sqrt{2}^2 = 2$

$$(x+2)^2 + (y+1)^2 = 2$$

3. Find the center and radius given the equation.  $(x-5)^2 + (y+2)^2 = 49$

Center  $(5, -2)$

Radius 7

4. Write an equation for the circle containing a center of  $(1, -3)$  and a point  $(2, 2)$ .

$$\textcircled{1} r = \sqrt{(2-1)^2 + (2+3)^2} \quad \textcircled{2} (x-1)^2 + (y+3)^2 = 26$$
$$= \sqrt{1^2 + 5^2}$$
$$= \sqrt{1+25}$$

$$r = \sqrt{26} \quad r^2 = \sqrt{26}^2 = 26$$

5. Write an equation for the circle containing a center of  $(4, 3)$  and a point  $(-1, 1)$ .

$$\textcircled{1} r = \sqrt{(-1-4)^2 + (1-3)^2} \quad \textcircled{2} (x-4)^2 + (y-3)^2 = 29$$
$$= \sqrt{(-5)^2 + (-2)^2}$$
$$= \sqrt{25+4}$$
$$r = \sqrt{29} \quad r^2 = (\sqrt{29})^2 = 29$$

6. Graph the following  $(x-2)^2 + (y+2)^2 = 64$ .

Center:  $(2, -2)$

radius:  $\sqrt{64} = 8$

