

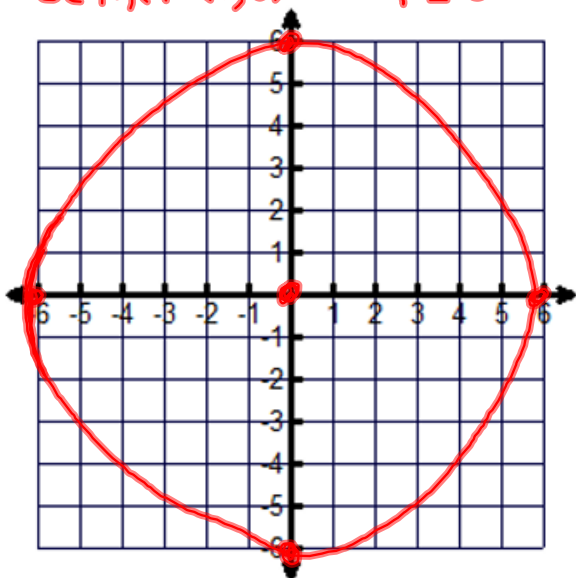
Section 12.4

Objective: Graphing Circles Notes

Equation of a Circle with Center at the Origin and Radius  $r$ :  $x^2 + y^2 = r^2$   
 $(0,0)$

Examples: Determine the center and radius of each circle, then graph the circle.

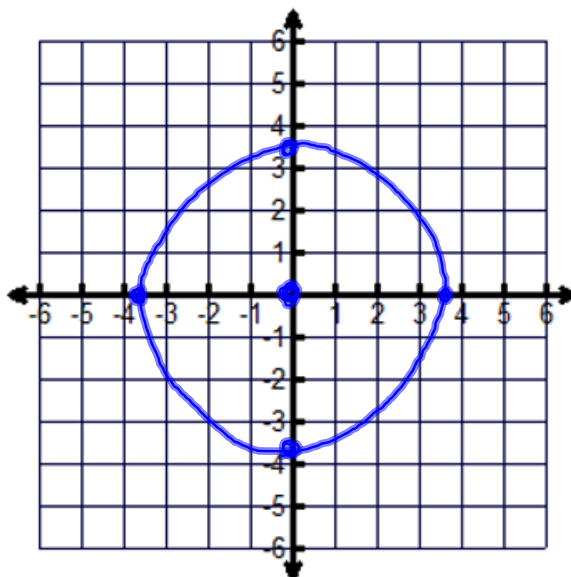
a)  $x^2 + y^2 = 36$        $r^2 = 36$   
 center  $(0,0)$        $r = 6$



Radius: 6

Center:  $(0,0)$

b)  $x^2 + y^2 = 13$



Radius:  $\sqrt{13} \approx 3.61$

Center:  $(0,0)$

**Example:** Write the equation of a circle with center at  $(0,0)$  and radius 11.

formula for equation of a circle with center at  $(a,b)$

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

$$x^2 + y^2 = 11^2$$

$$11^2 = 121$$
$$11 \cdot 11 = 121$$

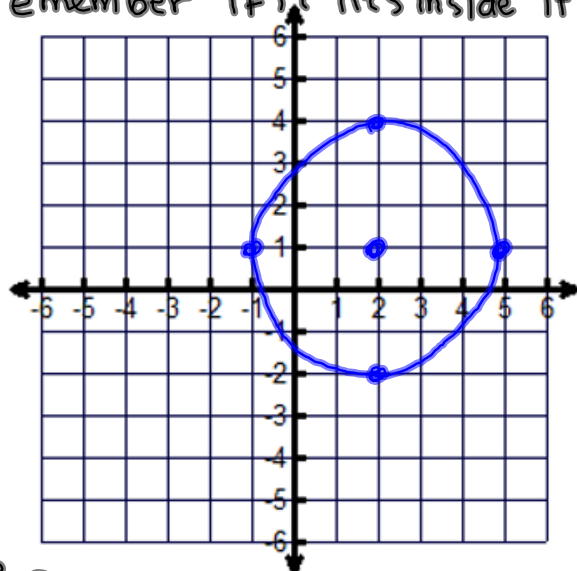
$$x^2 + y^2 = 121$$

**Equation of a Circle with Center at  $(h,k)$  and Radius  $r$ :  $(x-h)^2 + (y-k)^2 = r^2$**

**Examples:** Determine the center and radius of each circle, then graph the circle.

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

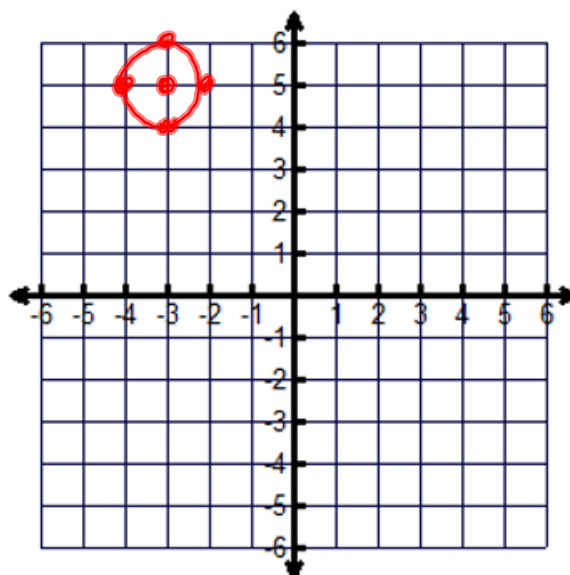
remember if it lies inside it lies!



$r^2 = 9$   
 Radius:  $r = \sqrt{9}$   $r = 3$

Center:  $(2, 1)$   
 from  $(x-2)$  from  $(y-1)$   
 2 1

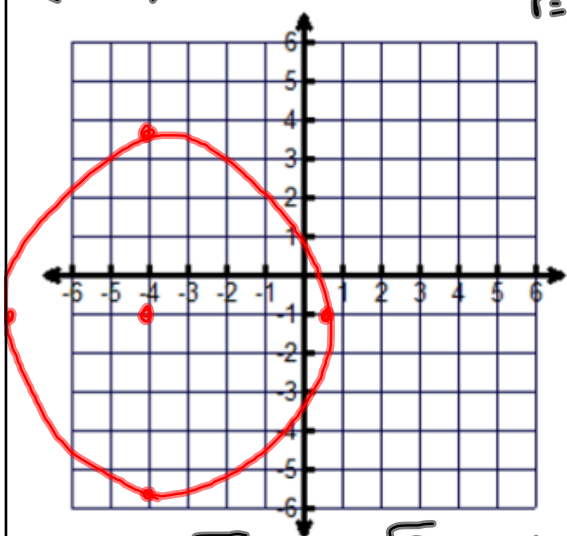
b)  $(x+3)^2 + (y-5)^2 = 1$



Radius:  $r^2 = 1$   $r = \sqrt{1}$   $r = 1$

Center:  $(-3, 5)$   
 from  $(x+3)$  from  $(y-5)$

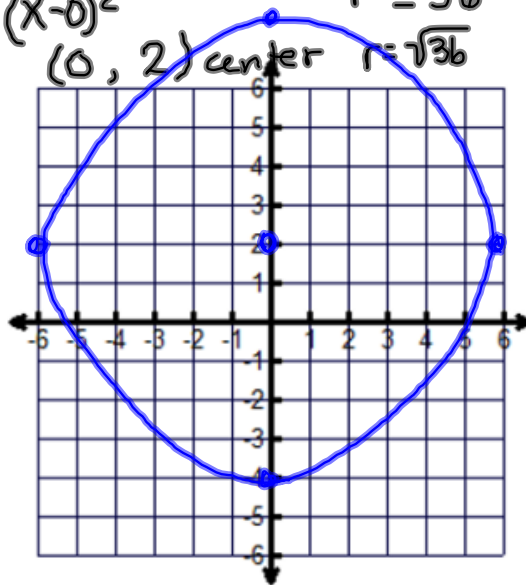
c)  $(x+4)^2 + (y+1)^2 = 20$   
 $(-4, -1)$  center  $r^2 = 20$   $r = \sqrt{20}$



Radius:  $\sqrt{20}$  or  $2\sqrt{5} \approx 4.47$

Center:  $(-4, -1)$

d)  $x^2 + (y-2)^2 = 36$   
 $(0, 2)$  center  $r^2 = 36$   $r = \sqrt{36}$



Radius:  $6$

Center:  $(0, 2)$

**Examples:** Write the equation of the circle with the given center and radius.

a)  $(2, 5); r = 7$

$(h, k)$   
Equation:  $(x-2)^2 + (y-5)^2 = 49$

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

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

$$7^2 = 49$$

c)  $(-2, 12); r = 15$

$(h, k)$   
Equation:  $(x+2)^2 + (y-12)^2 = 225$

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

$$(x--2)^2 + (y-12)^2 = 15^2$$

$$(x+2)^2 + (y-12)^2 = 225$$

e)  $(-6, -9); r = 1$

$(h, k)$   
Equation:  $(x+6)^2 + (y+9)^2 = 1$

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

$$(x--6)^2 + (y--9)^2 = 1^2$$

$$(x+6)^2 + (y+9)^2 = 1$$

b)  $(3, -1); r = \sqrt{13}$

$(h, k)$   
Equation:  $(x-3)^2 + (y+1)^2 = 13$

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

$$(x-3)^2 + (y--1)^2 = (\sqrt{13})^2$$

$$(x-3)^2 + (y+1)^2 = 13$$

d)  $(-5, 0); r = 2\sqrt{3}$

$(h, k)$   
Equation:  $(x+5)^2 + (y-0)^2 = 12$

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

$$(x--5)^2 + (y-0)^2 = (2\sqrt{3})^2$$

$$(x+5)^2 + (y-0)^2 = 12$$

f)  $(0, 4); r = \frac{1}{2}$

$(h, k)$   
Equation:  $(x-0)^2 + (y-4)^2 = \frac{1}{4}$

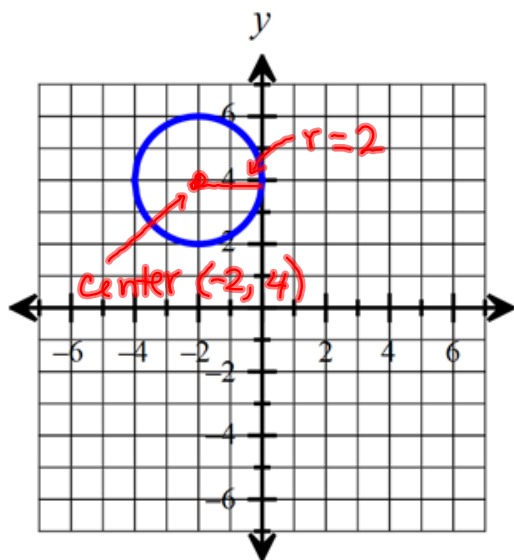
$$(x-h)^2 + (y-k)^2 = r^2$$

$$(x-0)^2 + (y-4)^2 = \left(\frac{1}{2}\right)^2$$

$$(x-0)^2 + (y-4)^2 = \frac{1}{4}$$

or  $(x-0)^2 + (y-4)^2 = .25$

g)



Radius: 2

Center: (-2, 4)

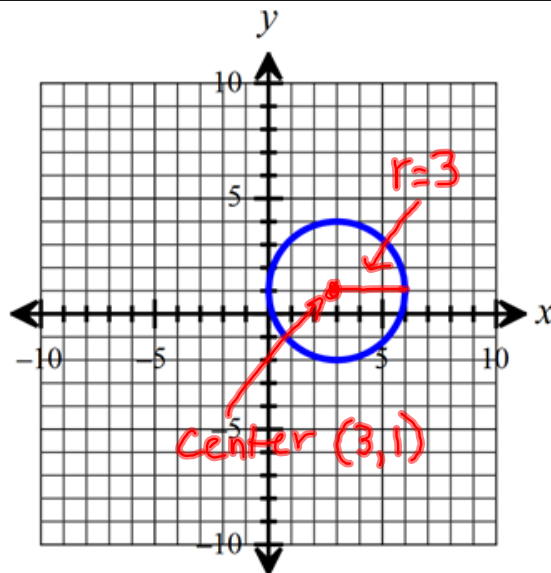
Equation:  $(x+2)^2 + (y-4)^2 = 4$

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

$$(x-(-2))^2 + (y-4)^2 = 2^2$$

$$(x+2)^2 + (y-4)^2 = 4$$

h)



Radius: 3

Center: (3, 1)

Equation:  $(x-3)^2 + (y-1)^2 = 9$

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

$$(x-3)^2 + (y-1)^2 = 3^2$$

$$(x-3)^2 + (y-1)^2 = 9$$