

10.3 Circles

A circle is the set of all points a certain distance, the radius, from a given point, the center.

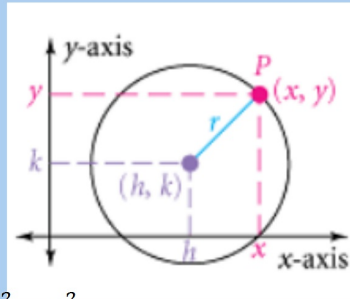
Standard Form of an Equation of a Circle:

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

Center (h, k) with radius r .

The graph of the equation

$(x - h)^2 + (y - k)^2 = r^2$ is the graph $x^2 + y^2 = r^2$ translated h units horizontally and k units vertically.



Write an equation for a circle with:

Center at $(0, 0)$ and radius 3 $(x - 0)^2 + (y - 0)^2 = 3^2$
 $x^2 + y^2 = 9$

Center $(5, -2)$ and radius 8 $(x - 5)^2 + (y + 2)^2 = 64$

Center $(-4, 7)$ and radius $2\sqrt{3}$ $(x + 4)^2 + (y - 7)^2 = 12$

Write an equation for each translation:

$x^2 + y^2 = 1$; left 5 and down 3

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

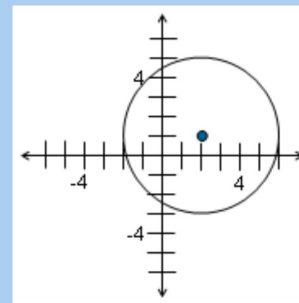
$x^2 + y^2 = 9$; right 2 and up 3

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

$x^2 + y^2 = 15$; left 8 and up 9

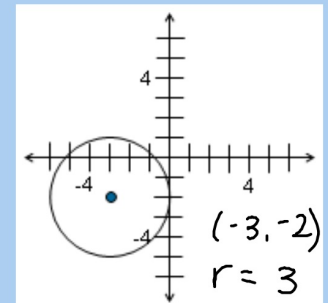
$$(x + 8)^2 + (y - 9)^2 = 15$$

Write the equations for the following circles:



Center
 $(2, 1)$
 $r = 4$

$$(x - 2)^2 + (y - 1)^2 = 16$$



$(-3, -2)$
 $r = 3$

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

Find the center and radius of the circle with the following equations:

$$x^2 + y^2 = 16$$

center (0,0)

radius 4

$$x^2 + (y-7)^2 = 144$$

(0,7)

r = 12

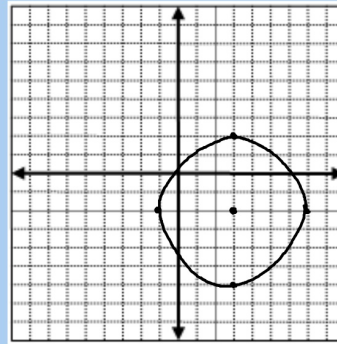
$$(x+8)^2 + (y+3)^2 = 121$$

(-8, -3)

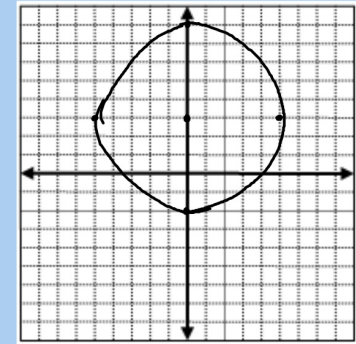
r = 11

Graph

$$(x-3)^2 + (y+2)^2 = 16$$



$$x^2 + (y-3)^2 = 25$$



Write the equation of a circle and find the center and radius of the circle.

$$\left(\frac{2}{2}\right)^2 = 1^2 = 1 \quad \left(\frac{4}{2}\right)^2 = 2^2 = 4$$

$$x^2 + 2x + y^2 + 4y - 11 = 0$$

$$x^2 + 2x + \underline{1} + y^2 + 4y + \underline{4} = 11 + \underline{1} + \underline{4}$$

$$(x+1)^2 + (y+2)^2 = 16$$

c = (-1, -2)

r = 4

Write the equation of a circle and find the center and radius of the circle.

$$\left(-\frac{10}{2}\right) = (-5)^2 = 25 \quad \left(\frac{9}{2}\right)^2 = \frac{81}{4}$$

$$x^2 + 3 + y^2 + 9y - 10x = 2$$

$$x^2 - 10x + \underline{25} + y^2 + 9y + \frac{\underline{81}}{4} = 2 - 3 + \underline{25} + \frac{\underline{81}}{4}$$

$$(x-5)^2 + \left(y + \frac{9}{2}\right)^2 = \frac{177}{4}$$

$$24 \rightarrow \frac{96}{4} + \frac{81}{4}$$

center (5, - $\frac{9}{2}$)

radius $\frac{\sqrt{177}}{2}$

Write the equation of a circle and find the center and radius of the circle.

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

$$x^2 + 2x + \underline{1} + y^2 = 11 + \underline{1}$$

$$(x+1)^2 + y^2 = 12$$

center $(-1, 0)$

radius $2\sqrt{3}$

Write the equation of a circle and find the center and radius of the circle.

$$x^2 + y^2 - 6x - 2y + 4 = 0$$

$$x^2 - 6x + \underline{9} + y^2 - 2y + \underline{1} = -4 + \underline{9} + \underline{1}$$

$$(x-3)^2 + (y-1)^2 = 6$$

center $(3, 1)$

radius $\sqrt{6}$