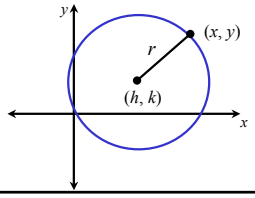
A **circle** is a set of points in the *xy*-plane that are a fixed distance *r* from a fixed point (*h*, *k*). The fixed distance *r* is called the **radius**, and the fixed point (*h*, *k*) is called the **center** of the circle.



The **standard form of an equation of a circle** with radius *r* and center (*h*, *k*) is

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

Graph $(x+1)^2+(y-3)^2=16$ by hand.

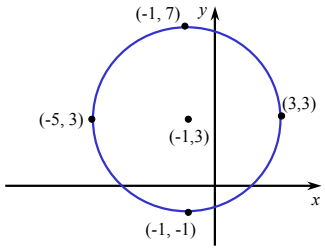
$$(x+1)^2+(y-3)^2=16$$

$$(x-(-1))^2+(y-3)^2=4^2$$

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

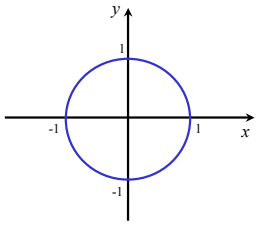
$h=-1,\ k=3,\ r=4$

Center: (-1, 3), Radius: 4



If the radius of a circle whose center is at the origin is $r=1$, then we have a **unit circle** whose equation is of the form

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



The **general form of the equation of a circle** is

$$x^2+y^2+ax+by+c=0$$

Find the center and radius of $x^2+y^2-4x+8y-5=0$.

$$x^2-4x+y^2+8y=5$$

$$x^2-4x+\_+y^2+8y+\_=5$$

$$\left(\frac{-4}{2}\right)^2=4 \qquad \left(\frac{8}{2}\right)^2=16$$

$$x^2-4x+4+y^2+8y+16=5+4+16$$

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

Center: (2, -4), Radius: 5