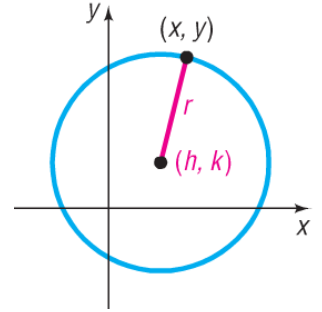


Circles

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



Standard Form of the Equation of a Circle with radius r and center (h, k) :

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

General Form of the Equation of a Circle:

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

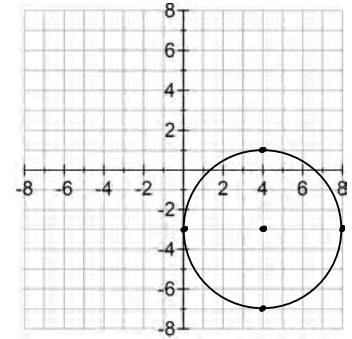
Example: Write the standard form of the equation and the general form of the equation of the circle with radius $r = 4$ and center $(h, k) = (4, -3)$. Then graph the circle.

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

$$(x-4)^2 + (y+3)^2 = 16$$

General: $x^2 - 8x + 16 + y^2 + 6y + 9 = 16$

$$x^2 + y^2 - 8x + 6y + 9 = 0$$



Examples: Find the center (h, k) and radius r of each circle, graph the circle, and find the intercepts, if any.

a) $(x+1)^2 + (y-2)^2 = 25$

Center: $(-1, 2)$

radius = $\sqrt{25} = 5$

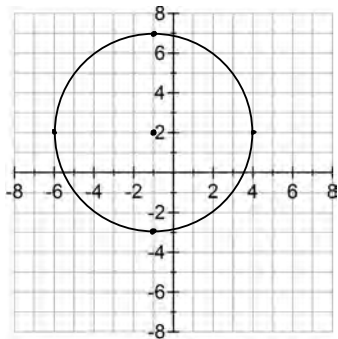
x-ints: $(x+1)^2 + (0-2)^2 = 25$
($y \rightarrow 0$) $(x+1)^2 + 4 = 25$

$$(x+1)^2 + 4 = 25$$

$$\sqrt{(x+1)^2} = \pm\sqrt{21}$$

$$x+1 = \pm\sqrt{21}$$

$$x = -1 \pm \sqrt{21}$$



y-ints:
($x \rightarrow 0$)

$$(0+1)^2 + (y-2)^2 = 25$$

$$1 + (y-2)^2 = 25$$

$$\sqrt{(y-2)^2} = \pm\sqrt{24}$$

$$y-2 = \pm 2\sqrt{6}$$

$$y = 2 \pm 2\sqrt{6}$$

b) $\frac{3(x+1)^2 + 3(y-1)^2}{3} = \frac{6}{3}$

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

Center: $(-1, 1)$ radius: $\sqrt{2} \approx 1.4$

x-ints: $(x+1)^2 + (0-1)^2 = 2$

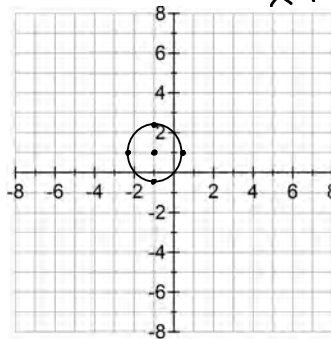
$$(x+1)^2 + 1 = 2$$

$$\sqrt{(x+1)^2} = \pm\sqrt{1}$$

$$x+1 = \pm 1$$

$$x = -1 \pm 1$$

$$\begin{matrix} x = 0 \\ x = -2 \end{matrix}$$



y-ints:

$$(0+1)^2 + (y-1)^2 = 2$$

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

$$\sqrt{(y-1)^2} = \pm\sqrt{1}$$

$$y-1 = \pm 1$$

$$y = 1 \pm 1$$

$$y = 0, y = 2$$

