

1.4 Circles

In this section we will be analyzing graphs and equations of circles. First let us derive the equation of a circle. It follows from what we learned in the last section.

To derive the equation of a circle, we can use the distance formula with the points (h, k) and (x, y) and the distance r .

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \quad \text{First we start with the distance formula.}$$

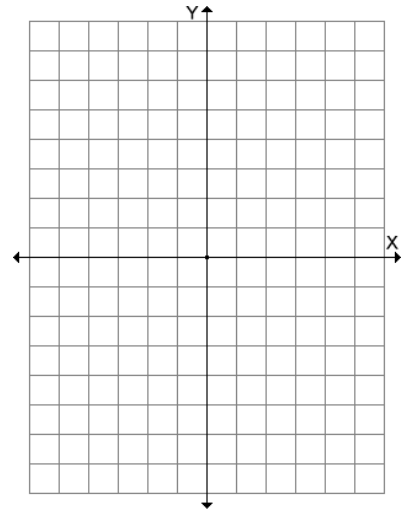
$$r = \sqrt{(x - h)^2 + (y - k)^2} \quad \text{Next we substitute the given points.}$$

$$r^2 = (x - h)^2 + (y - k)^2 \quad \text{Square both sides. This is the circle formula.}$$

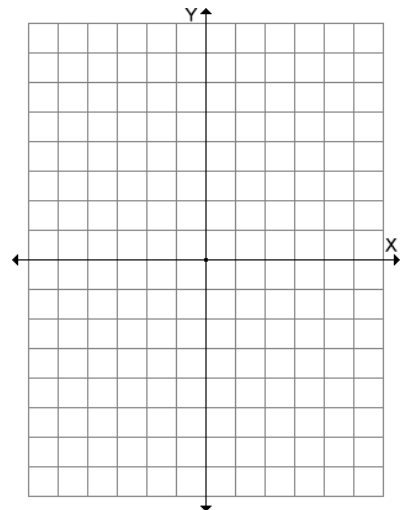
Standard Form

$$(x - h)^2 + (y - k)^2 = r^2 \quad \text{where } (h, k) \text{ is the center and } r \text{ is the radius}$$

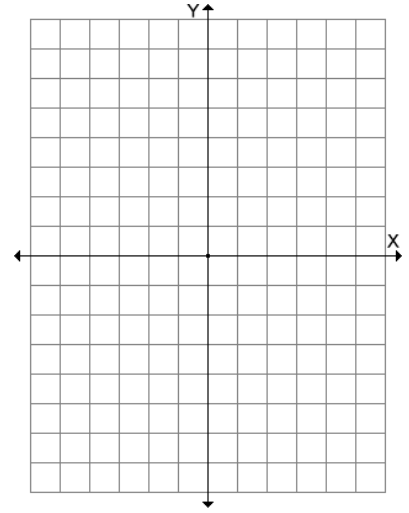
EXAMPLE 1: Write the standard form of a circle with a center of $(-2, 3)$ and a radius of 4 and graph.



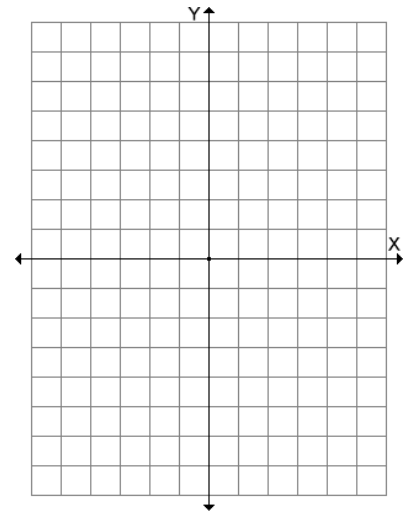
EXAMPLE 2: Write the standard form of a circle with a center of $(5, 1)$ and a radius of 3 and graph.



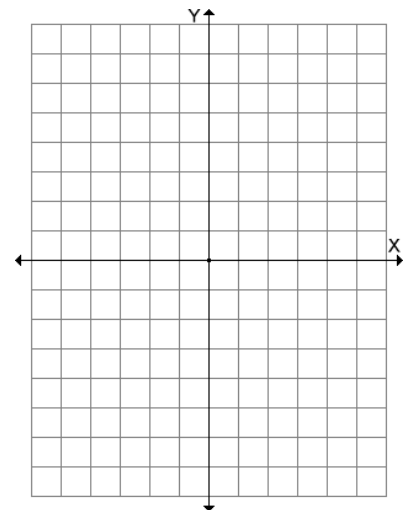
EXAMPLE 3: Find the center and radius and graph: $(x + 1)^2 + (y - 3)^2 = 25$



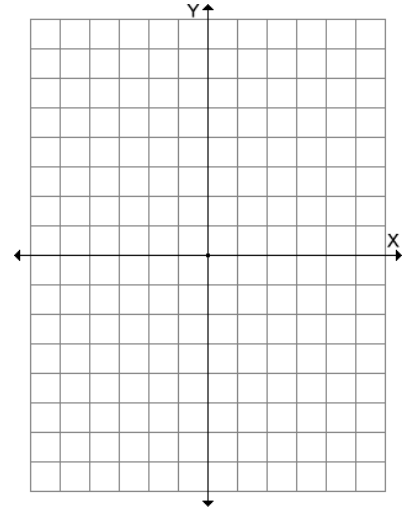
EXAMPLE 4: Find the center and radius and graph: $(x - 3)^2 + y^2 = 13$



EXAMPLE 5: Find the center and radius and graph: $x^2 + y^2 + 10x - 8y + 16 = 0$



EXAMPLE 6: Find the center and radius and graph: $2x^2 + 2y^2 + 8x + 7 = 0$



EXAMPLE 7: The endpoints of the diameter of a circle is $(2, 6)$ and $(-4, -2)$. Determine the coordinates for the center of the circle, and find the length of the radius. Then write the standard form of the circle.

Standard form of a circle formula: $(x + 1)^2 + (y - 2)^2 = 25$