

Lesson 82 Objective: SWBAT write and graph equations of circles.

Kickoff- Complete the square for each of the following.

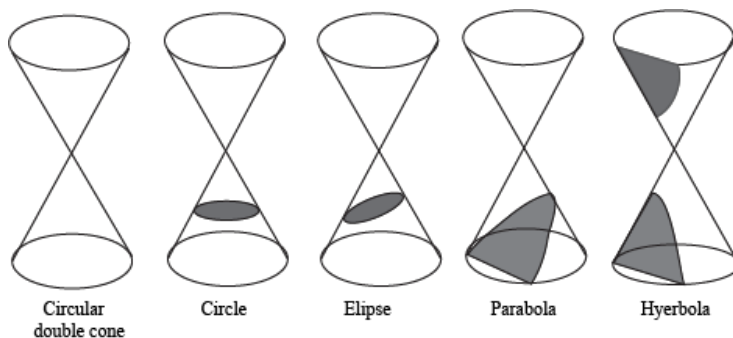
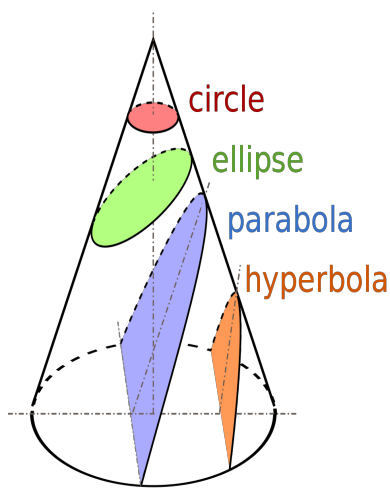
1) $x^2 + 14x - 51 = 0$

$$\begin{aligned} &+51+51 \\ &x^2 + 14x = 51 \\ &\frac{1}{2}(14) \quad x^2 + 14x + 49 = 51 + 49 \\ &(x+7)^2 = 100 \\ &\sqrt{(x+7)^2} = \sqrt{100} \\ &x+7 = \pm 10 \\ &\begin{aligned} x+7 &= 10 & x+7 &= -10 \\ x &= 3 & x &= -17 \end{aligned} \end{aligned}$$

2) $7k^2 = 14k + 29$

$$\begin{aligned} &-14k - 14k \\ &7k^2 - 14k = 29 \\ &\frac{1}{2}(-14) \quad k^2 - 2k = \frac{29}{7} \\ &(k-1)^2 = \frac{29}{7} + 1 \\ &\sqrt{(k-1)^2} = \sqrt{\frac{36}{7}} \\ &k-1 = \pm \frac{6}{\sqrt{7}} \sqrt{7} \\ &k-1 = \pm \frac{6\sqrt{7}}{7} \\ &k = 1 \pm \frac{6\sqrt{7}}{7} \end{aligned}$$

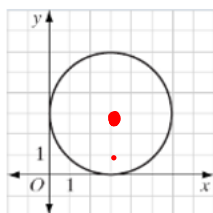
Conic Sections



Equations of Circles:

Recall: Given the circles graphed below, determine the coordinates of the center point and the radius.

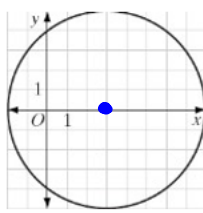
1)



Center =
Radius =

(3, 3)
3

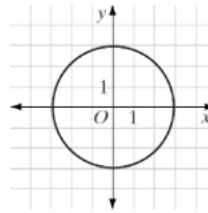
2)



Center =
Radius =

(3, 0)
5

3)



Center =
Radius =

(0, 0)
3

Equation of a circle in Center-Radius form:

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

Center
= Radius

(h, k) * opposite signs

Write the equation of each circle above in center-radius form.

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

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

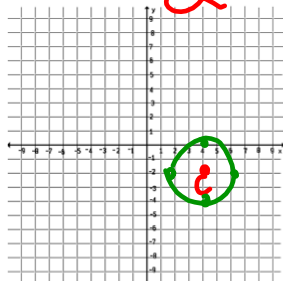
3) $x^2 + y^2 = 9$

Given the following equations, determine the center and radius. The graph the circle.

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

Center: (4, -2)

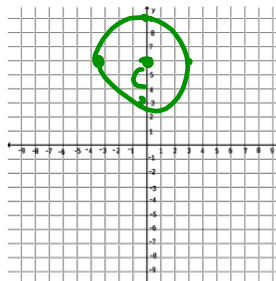
Radius: 2



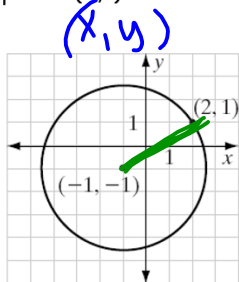
b) $x^2 + (y - 6)^2 = 3^2$

Center: (0, 6)

Radius: 3



Example: Write the equation of a circle, in center-radius form with a center $C(-1,-1)$ with point $P(2,1)$ on the circle.



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

$$(2+1)^2 + (1+1)^2 = 13$$

$$\text{Center} = (-1, -1)$$

$$r = \sqrt{13}$$

Write the Equation of a Circle in standard form:

Equation of a circle in Standard form:

$$* x^2 + y^2 + Cx + Dy + E = 0 *$$

Example: Write the equation found in the example above in standard form.

$$(x+1)(x+1) \quad (x+1)^2 + (y+1)^2 = 13$$

$$x^2 + 2x + 1 + y^2 + 2y + 1 - 13 = 0$$

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

Standard Form to Center-Radius Form

Write each equation in center-radius form and then find the center and the radius.

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

$$\quad \quad \quad -1 \quad -1$$

$$x^2 + 2x + y^2 - 4y = -1$$

$$\quad \quad \quad +1 \quad +4$$

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

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

$$r = 2$$

$$(-1, 2)$$

$$2) 4x^2 + 4y^2 - 16x - 24y + 50 = 0.$$

$$\quad \quad \quad -50 \quad -50$$

$$4x^2 - 16x + 4y^2 - 24y = -50$$

$$\frac{4(x^2 - 4x)}{4} + \frac{4(y^2 - 6y)}{4} = \frac{-50}{4}$$

$$x^2 - 4x + y^2 - 6y = -\frac{25}{2} + 4 + 9$$

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

$$r = \sqrt{\frac{1}{2}} = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$$

Center $(2, 3)$