

Circle

$$x^2 + y^2 - 10x + 8y = -25$$

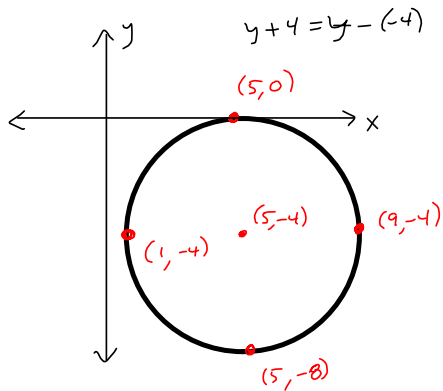
$$x^2 - 10x + 5^2 \quad y^2 + 8y + 4^2 = -25 + 25 + 16$$

$$\frac{10}{2} = 5 \rightarrow 5^2 \quad \frac{8}{2} = 4 \rightarrow 4^2$$

$$(x-5)^2 + (y+4)^2 = 16 = 4^2$$

$(5, -4)$   
 $r = 4$

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



$$x = 9 \cos \theta + 3$$

$$y = 9 \sin \theta - 6$$

$$x-3 = 9 \cos \theta \Rightarrow \frac{x-3}{9} = \cos \theta$$

$$y+6 = 9 \sin \theta \Rightarrow \frac{y+6}{9} = \sin \theta$$

$$\sin^2 \theta + \cos^2 \theta = \left(\frac{x-3}{9}\right)^2 + \left(\frac{y+6}{9}\right)^2 = 1$$

$$\frac{(x-3)^2}{9^2} + \frac{(y+6)^2}{9^2} = 1$$

$$(x-3)^2 + (y+6)^2 = 81$$

$$(h, k) = (3, -6)$$

$$r = 9$$

Ellipse

$$16x^2 + 9y^2 - 160x + 72y = -400$$

$$16x^2 - 160x + 9y^2 + 72y = -400$$

$$16(x^2 - 10x + 5^2) + 9(y^2 + 8y + 4^2) = -400 + 16(25) + 16(9)$$

$$16(x-5)^2 + 9(y+4)^2 = 144$$

$$\frac{16(x-5)^2}{144} + \frac{9(y+4)^2}{144} = 1$$

$$\frac{(x-5)^2}{9} + \frac{(y+4)^2}{16} = 1$$

$9=3^2$        $16=4^2$   
 left/right      up/down  
 3                      4

from  $(h, k) = (5, -4)$

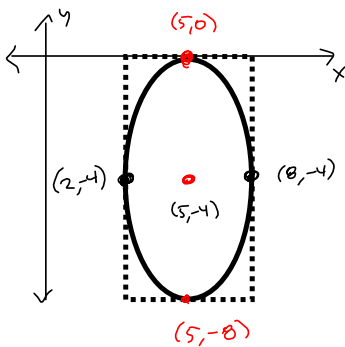
$$\begin{array}{r}
 254 \\
 \underline{16} \\
 204 \\
 340 \\
 \underline{544} \\
 -400 \\
 \hline
 144
 \end{array}$$

$$x = 7 \cos \theta + 3$$

$$y = 9 \sin \theta - 6$$

$$\left(\frac{x-3}{7}\right)^2 + \left(\frac{y+6}{9}\right)^2 = 1$$

$$\frac{(x-3)^2}{7^2} + \frac{(y+6)^2}{9^2} = 1$$



Hyperbola

$$16x^2 - 9y^2 - 160x - 72y + 544 = 432$$

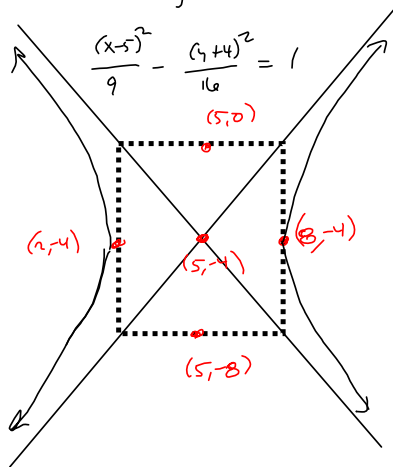
$$x = 7 \sec \theta + 3$$

$$y = 9 \tan \theta - 6$$

$$16x^2 - 160x - 9y^2 - 72y = -112$$

$$16(x^2 - 10x + 25) - 9(y^2 + 8y + 16) = -112 + (25)(16) - 16(9)$$

$$16(x-5)^2 - 9(y+4)^2 = 144$$



$$\frac{25}{16} = \frac{100}{4} \cdot 16$$

(5, 0)?

$$\frac{(5-5)^2}{9} - \frac{(0+4)^2}{16} = 1$$

$$-\frac{16}{16} = 1$$

Nope!

$$\frac{(8-5)^2}{9} - \frac{(-4+4)^2}{16} = 1?$$

$$1 = 1 \checkmark$$

