

ADDITIONAL TOPIC: SOLVING QUADRATIC SYSTEMS

Ex: Solve $x^2 - y^2 = 9$

$$x^2 + 9y^2 = 169$$

$$\begin{array}{r} x^2 - y^2 = 9 \\ -x^2 - 9y^2 = -169 \\ \hline \end{array}$$

$$-10y^2 = -160$$

$$y^2 = 16$$

$$y = 4, -4$$

If $y = 4$

$$x^2 - 4^2 = 9$$

$$x^2 - 16 = 9$$

$$x^2 = 25$$

$$x = \pm 5 \quad (5, 4) (-5, 4)$$

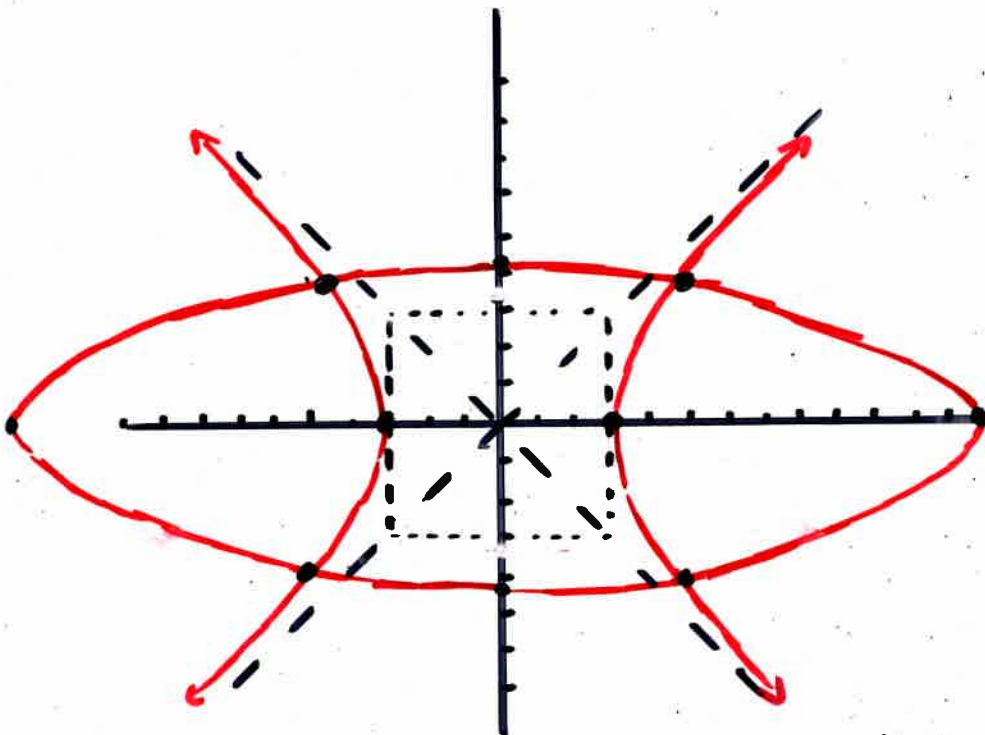
If $y = -4$

$$x^2 - (-4)^2 = 9$$

$$x^2 - 16 = 9$$

$$x^2 = 25$$

$$x = \pm 5 \quad (5, -4) (-5, -4)$$



$$x^2 - y^2 = 9$$

HYPERBOLA

$$\frac{x^2}{9} - \frac{y^2}{9} = 1$$

$$x^2 + 9y^2 = 169$$

$$\frac{x^2}{169} + \frac{y^2}{\frac{169}{9}} = 1$$

ELLIPSE

SUBSTITUTION

$$x^2 - y^2 = 9 \quad \rightarrow \quad x^2 = 9 + y^2$$

$$x^2 + 9y^2 = 169$$

$$(9 + y^2) + 9y^2 = 169$$

$$10y^2 + 9 = 169$$

$$10y^2 = 160$$

$$y^2 = 16$$

$$y = \pm 4$$

CONTINUE AS BEFORE

$$(5, 4) \quad (-5, 4) \quad (5, -4) \quad (-5, -4)$$

Algebra Section 10.7 Quadratic Systems.notebook

Example: Solve the System of Equations given below.

$$x^2 + 2y^2 - 4x + 6y - 5 = 0$$

$$x^2 - 4x - y + 3 = 0$$

$$\begin{array}{r} x^2 + 2y^2 - 4x + 6y - 5 = 0 \\ -x^2 + 4x + y - 3 = 0 \\ \hline \end{array}$$

$$2y^2 + 7y - 8 = 0$$

$$y = \frac{-7 \pm \sqrt{49 - 4(2)(-8)}}{4}$$

$$= \frac{-7 \pm \sqrt{113}}{4}$$

$$y_1 = \frac{-7 + \sqrt{113}}{4} \quad y_2 = \frac{-7 - \sqrt{113}}{4}$$

$$y = x^2 - 4x + 3$$

$$\frac{-7 + \sqrt{113}}{4} = x^2 - 4x + 3$$

$$x^2 - 4x + 3 + \frac{7}{4} - \frac{\sqrt{113}}{4} = 0$$

$$4x^2 - 16x + 12 + 7 - \sqrt{113} = 0$$

a
 b
 c

$$x = \frac{16 \pm \sqrt{256 - 4(4)(12 + 7 - \sqrt{113})}}{8}$$

So FAR, SOLUTIONS

$$\left(\frac{16 \pm \sqrt{256 - 16(19 - \sqrt{113})}}{8}, \frac{-7 + \sqrt{113}}{4} \right)$$

WHEN $y = \frac{-7 - \sqrt{113}}{4}$

$$\frac{-7 - \sqrt{113}}{4} = x^2 - 4x + 3$$

$$x^2 - 4x + 3 + \frac{7}{4} + \frac{\sqrt{113}}{4} = 0$$

$$4x^2 - 16x + 12 + 7 + \sqrt{113} = 0$$

$$x = \frac{16 \pm \sqrt{256 - 4(4)(12 + 7 + \sqrt{113})}}{2(4)}$$

NOT REAL < 0

Example: Solve the System of Equations given below.

$$x^2 + 2y^2 - 4x + 6y - 5 = 0$$

$$x^2 - 4x - y + 3 = 0$$

