

## 10-3

Solving a system of linear and quadratic equations algebraically

Objective: I can solve a system of linear and/or quadratic equations algebraically

## Warm-Up

Solve the system algebraically

Substitution  
Elimination

$$\begin{cases} y = -3x + 4 \\ y = 3x - 2 \end{cases}$$

Solve for x:  $x^2 - 2x - 24 = 0$

$$(x-6)(x+4) = 0$$

$$x=6, -4$$

Put into standard form:  $y = 2(x-1)^2 + 5$

$$y = 2(x-1)(x-1) + 5$$

$$y = 2(x^2 - x - x + 1) + 5$$

$$y = 2(x^2 - 2x + 1) + 5$$

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

$$y = 2x^2 - 4x + 7$$

How can we SOLVE if we don't get integer solutions graphically?

Substitution Elimination

When solving a system of linear equations algebraically, what methods can we use to solve?

DIDO

What are all the different ways we know how to SOLVE a QUADRATIC equation?

FACTORING & QUADRATIC formula

Find the real solutions of the given system algebraically :

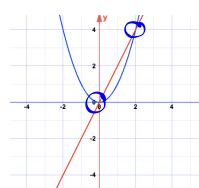
$$\begin{cases} y = x^2 - 4 \\ y = 2x \end{cases}$$

Elimination

$$\begin{array}{r} y = x^2 \\ - y = 2x \\ \hline 0 = x^2 - 2x \end{array}$$

Substitution

$$\begin{aligned} x^2 &= 2x \\ -2x &\quad -2x \\ x^2 - 2x &= 0 \\ x(x-2) &= 0 \\ x = 0, 2 & \\ (0, 0), (2, 4) & \end{aligned}$$

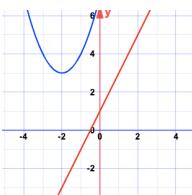


Find the real solutions of the given system algebraically :

$$\begin{cases} y = x^2 + 4x + 7 \\ y = 2x + 1 \end{cases}$$

$0 = x^2 + 2x + 6$   
 $x = \frac{-2 \pm \sqrt{4 - 4(6)}}{2(1)}$

No real solution

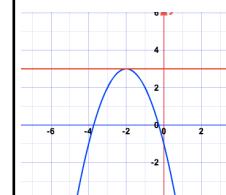


Find the real solutions of the given system algebraically :

$$\begin{cases} y = -(x+2)^2 + 3 \\ y = 3 \end{cases}$$

$$\begin{aligned} 3 &= -(x+2)^2 + 3 \\ -3 &= -(x+2)^2 \\ \frac{0}{-1} &= -(x+2)^2 \\ 0 &= (x+2)^2 \end{aligned}$$

$x+2 = 0$   
 $x = -2$



Find the real solutions of the given system algebraically :

$$\begin{cases} y = 6x^2 + 5x \\ y = 4x + 2 \end{cases}$$

$$0 = 6x^2 + x - 2$$

$$x = \frac{-1 \pm \sqrt{1+4(6)(-2)}}{2(6)}$$

$$x = \frac{-1 \pm \sqrt{49}}{12}$$

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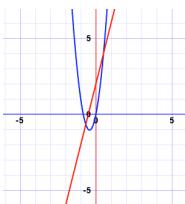
$$x = \frac{-1 \pm 7}{12} = \frac{-1+7}{12} = \frac{6}{12} = \frac{1}{2}$$

$$x = \frac{-1-7}{12} = \frac{-8}{12} = -\frac{2}{3}$$

$$y = 4(\frac{1}{2}) + 2 = 2 + 2 = 4$$

$$y = 4(-\frac{2}{3}) + 2 = -\frac{8}{3} + \frac{6}{3} = -\frac{2}{3}$$

$$(\frac{1}{2}, 4) \quad (-\frac{2}{3}, -\frac{2}{3})$$



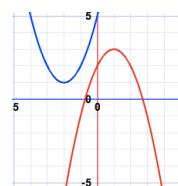
Find the real solutions of the given system algebraically :

$$\begin{cases} y = x^2 + 4x + 5 \\ y = -x^2 + 2x + 2 \end{cases}$$

$$0 = 2x^2 + 2x + 3$$

$$x = \frac{-2 \pm \sqrt{4 - 4(2)(3)}}{2(2)}$$

NO real solution



Find the real solutions of the given system algebraically :

$$\begin{cases} y = x^2 + 2 \\ y = -x^2 + 2x + 2 \end{cases}$$

$$0 = 2x^2 - 2x$$

$$0 = 2x(x-1)$$

$$x = 0, 1$$

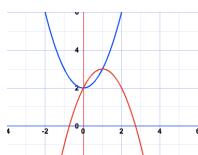
$$y = 0^2 + 2$$

$$y = 1^2 + 2$$

$$= 1 + 2$$

$$= 3$$

$$(0, 2) \text{ and } (1, 3)$$



Find the real solutions of the given system algebraically :

$$\begin{cases} y = (x-3)^2 + 4 \\ y = -2(x-3)^2 + 4 \end{cases}$$

$$(x-3)(x-3)$$

$$x^2 - 3x - 3x + 9$$

$$x^2 - 6x + 9$$

$$(3, 4)$$

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

$$-2(x-3)^2 = (x-3)^2$$

$$-2x^2 + 12x - 18 = x^2 - 6x + 9$$

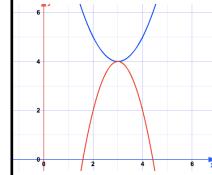
$$+2x^2 - 12x + 18 = 12x^2 - 12x + 18$$

$$0 = 3x^2 - 18x + 27$$

$$0 = 3(x^2 - 6x + 9)$$

$$0 = 3(x-3)(x-3)$$

$$x = 3$$



Find the real solutions of the given system algebraically :

$$\begin{cases} y = 2x^2 - 5x - 1 \\ y = x^2 - 3x + 1 \end{cases}$$

$$0 = x^2 - 2x - 2$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{2 \pm \sqrt{4 + 8}}{2}$$

$$x = \frac{2 \pm \sqrt{12}}{2}$$

$$(1 \pm \sqrt{3}, 1 \mp \sqrt{3})$$

$$x = \frac{1 \pm \sqrt{1 + 2\sqrt{3}}}{2}$$

$$y = (1 \pm \sqrt{3})^2 - 3(1 \pm \sqrt{3}) + 1$$

$$y = 1 \pm 2\sqrt{3} + 3 - 3(1 \pm \sqrt{3}) + 1$$

$$y = 1 \pm 2\sqrt{3} - 3 + 3 + 6\sqrt{3} + 1$$

$$y = 1 \pm 6\sqrt{3} + 1$$

