1. $\begin{cases} y = -x^2 + 6x - 6 & Q \\ y = 3x + 1 & L \end{cases}$ $a = -1$

$y = mx + b$

slope, y-int

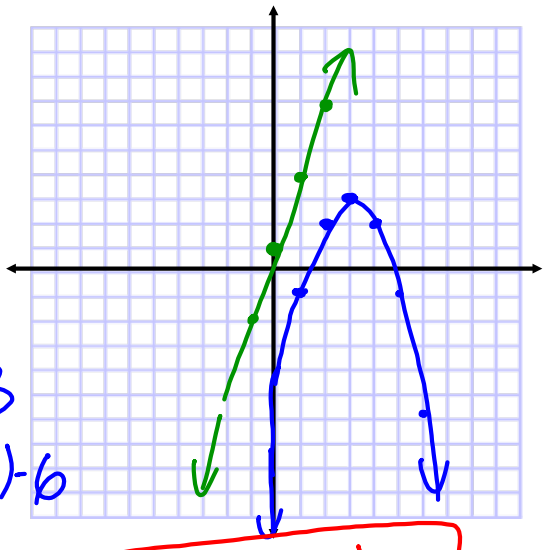
x-coord: $x = \frac{-b}{2a} = \frac{-6}{2(-1)} = 3$

y-coord: $y = -(3)^2 + 6(3) - 6$

$= -9 + 18 - 6$

$= 3$

$V: (3, 3)$



no soln

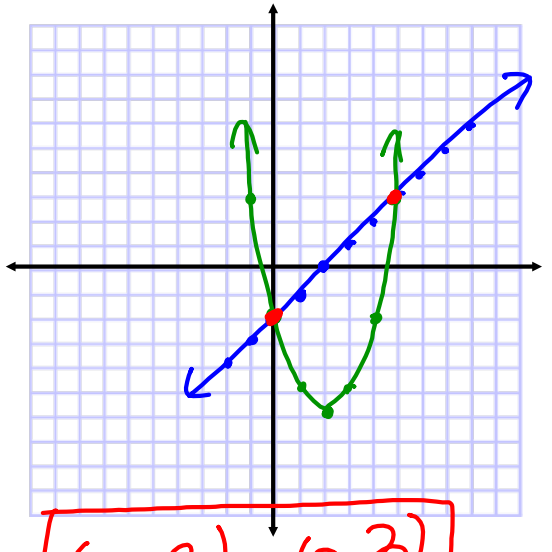
3. $\begin{cases} y = x^2 - 4x - 2 & a = 1 \\ y = \frac{1}{1}x - 2 \end{cases}$

$V: (2, -6)$

$x = \frac{-b}{2a} = \frac{+4}{2(1)} = 2$

$y = (2)^2 - 4(2) - 2$

$4 - 8 - 2 = -6$

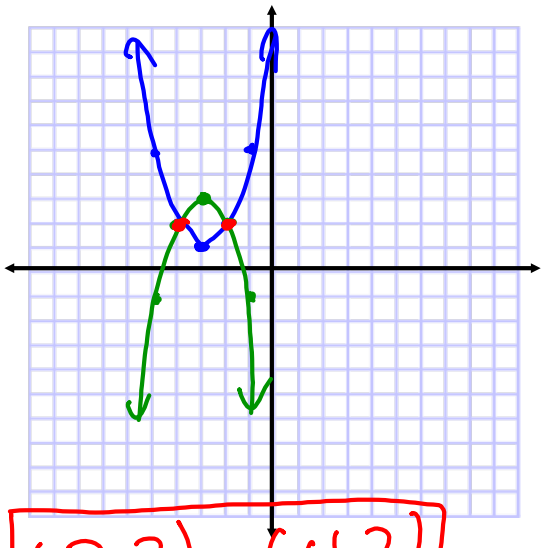


(0, -2) (5, 3)

10. $\begin{cases} y = (x+3)^2 + 1 \\ y = -(x+3)^2 + 3 \end{cases}$

$V: (-3, 1) \quad a = 1$

$V: (-3, 3) \quad a = -1$



$(-2, 2) \quad (-4, 2)$

9-3

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

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

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

$+3x \quad +3x$

$4 = 6x - 2$

$+2 \quad +2$

$\frac{6}{6} = \frac{6x}{6}$

$1 = x$

$(1, 1)$

$y = -3(1) + 4 = 1$

$y = 3(1) - 2 = 1$

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

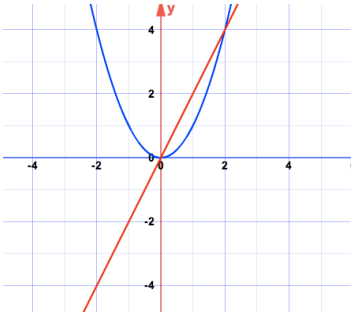
When solving a system of linear equations algebraically, what methods can we use to solve?

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

1. quadratic formula
2. Factor

Find the real solutions of the given system algebraically :

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



Find the real solutions of the given system algebraically :

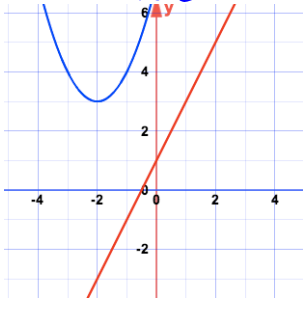
$$\begin{cases} y = x^2 + 4x + 7 \\ y = 2x + 1 \end{cases}$$

$1 \cdot 6 = 6$

$1 \quad 6$

$2 \quad 3$

not factorable



$x^2 + 4x + 7 = 2x + 1$

$-2x - 1 \quad -2x - 1$

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

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

$x = \frac{-2 \pm \sqrt{4 - 24}}{2}$

$x = \frac{-2 \pm \sqrt{-20}}{2}$

no soln

Find the real solutions of the given system algebraically :

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

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

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

$(x+2)^2 = (x+2)(x+2)$

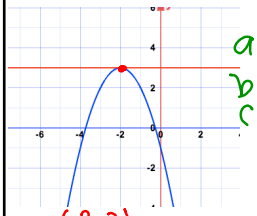
$x^2+2x+2x+4$

x^2+4x+4

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

$-3 \quad -3$

$-x^2-4x-4 = 0$



$a=-1$

$b=-4$

$c=-4$

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

$x = \frac{4 \pm \sqrt{16-16}}{-2}$

$x = \frac{4 \pm \sqrt{0}}{-2}$

(-2,3)

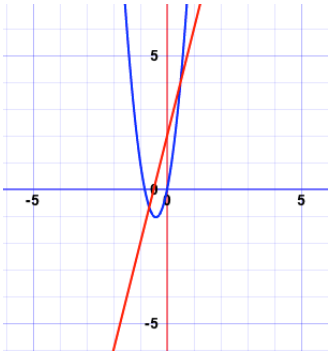
plug x into $y=3$

$x = \frac{4}{-2} = -2$

$(-2,3)$

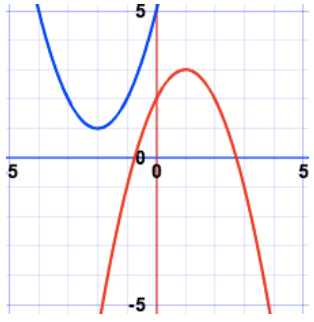
Find the real solutions of the given system algebraically :

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



Find the real solutions of the given system algebraically :

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



Find the real solutions of the given system algebraically :

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

$x^2 + 2 = -x^2 + 2x + 2$

$+x^2 \quad -2 \quad +x^2 \quad -2$

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

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

$\frac{2x}{2} = \frac{0}{2}$ $\qquad -x + 1 = 0$

$x = 0$ $\qquad -1 \quad -1$

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

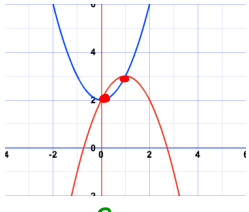
$x = 1$

$(0, 2)$ $\qquad (1, 3)$

$y = 0^2 + 2$ $\qquad y = 1^2 + 2$

$= 0 + 2$ $\qquad = 1 + 2$

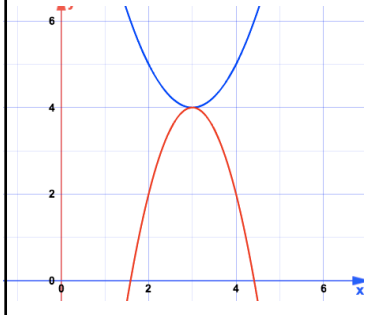
$= 2$ $\qquad = 3$



$y = x^2 + 2$

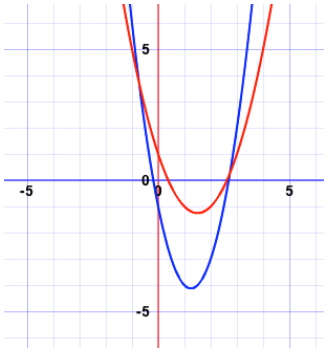
Find the real solutions of the given system algebraically :

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



Find the real solutions of the given system algebraically :

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



15. $\begin{cases} y = 2x^2 + 10x + 2 \\ y = -2x^2 + x - 1 \end{cases}$

$2x^2 + 10x + 2 = -2x^2 + x - 1$

$+2x^2 \quad -x \quad +1 \qquad +2x^2 \quad -x \quad +1$

$4x^2 + 9x + 3 = 0$

$a = 4$

$b = 9$

$c = 3$

$x = \dfrac{-9 \pm \sqrt{9^2 - 4(4)(3)}}{2(4)}$

$x = \dfrac{-9 \pm \sqrt{81 - 48}}{8}$

$x = \dfrac{-9 \pm \sqrt{33}}{8}$

$\dfrac{-9 + \sqrt{33}}{8} \approx -0.41$

$\dfrac{-9 - \sqrt{33}}{8} \approx -1.84$

$(-0.41, -1.75)$

$(-1.84, -9.61)$

$-2x^2 + x - 1$

$-2(-0.41)^2 + (-0.41) - 1 \approx -1.75$