

## Sec. 4.9 Quadratic Systems

Problem 1: What is the solution of the system?

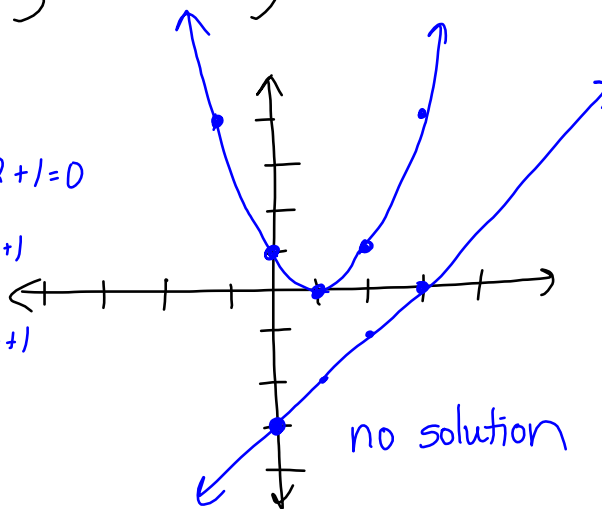
$$a. \begin{cases} y = x^2 - 2x + 1 \\ y = x - 3 \end{cases} \text{ by graphing}$$

$$-\frac{b}{2a} = \frac{2}{2 \cdot 1} = 1$$

$$y = 1^2 - 2 \cdot 1 + 1 = 1 - 2 + 1 = 0$$

$$V: (1, 0) \quad \begin{array}{c|c} x & y \\ \hline 2 & 1 \quad 4 - 4 + 1 \\ 3 & 4 \quad 9 - 6 + 1 \end{array}$$

$$C = 1$$



$$b. \begin{cases} y = x^2 + 3x + 9 \\ y = -3x + 4 \end{cases} \text{ substitution}$$

$$\begin{array}{r} -3x + 4 = x^2 + 3x + 9 \\ +3x - 4 \quad \quad \quad +3x - 4 \\ \hline \end{array}$$

$$0 = x^2 + 6x + 5 \quad 1.5$$

$$0 = (x+1)(x+5)$$

$$\begin{array}{r} x + 1 = 0 \quad x + 5 = 0 \\ -1 \quad -1 \quad -5 \quad -5 \\ \hline \end{array}$$

$$x = -1$$

$$x = -5$$

$$(-1, 7)$$

$$(-5, 19)$$

$$y = -3x + 4 \quad \begin{array}{r} -3(-1) + 4 \\ 3 + 4 \\ 7 \end{array}$$

$$\begin{array}{r} -3(-5) + 4 \\ 15 + 4 \\ 19 \end{array}$$

$$\begin{aligned}
 & C. \quad y = x^2 + 9x + 7 \quad x^2 + 9x + 7 = -x^2 + 3x + 7 \\
 & -1 \quad (y = -x^2 + 3x + 7) \quad +x^2 - 3x - 7 \quad +x^2 - 3x - 7 \\
 & \quad y = x^2 + 9x + 7 \\
 & \quad -y = x^2 - 3x - 7 \\
 & \quad \hline
 & \quad 0 = 2x^2 + 6x \\
 & \quad 0 = 2x(x + 3) \\
 & \quad \frac{2x}{2} = \frac{0}{2} \quad \frac{x + 3}{-3} = \frac{0}{-3} \\
 & \quad x = 0 \quad x = -3 \\
 & \quad x = 0 \quad y = 0^2 + 9 \cdot 0 + 7 = 7 \quad \boxed{(0, 7)} \\
 & \quad x = -3 \quad y = (-3)^2 + 9(-3) + 7 = 9 - 27 + 7 = -11 \quad \boxed{(-3, -11)}
 \end{aligned}$$

Problem 2: What is the solution to this system of inequalities?

solid, above  $y \geq x^2 + 5x - 8$       dashed, below  $y < -x^2 + 3x + 4$

$$\begin{aligned}
 -\frac{b}{2a} &= -\frac{-5}{2} \quad v: \left(-\frac{5}{2}, -\frac{57}{4}\right) \quad \frac{-3}{2(-1)} = \frac{3}{2} \quad \left(\frac{3}{2}, \frac{25}{4}\right) \\
 y &= \left(-\frac{5}{2}\right)^2 + 5\left(-\frac{5}{2}\right) - 8 \quad y = -\left(\frac{3}{2}\right)^2 + 3\left(\frac{3}{2}\right) + 4 \\
 &= \frac{25}{4} - \frac{25 \cdot 2}{2 \cdot 2} - \frac{8 \cdot 4}{1 \cdot 4} \quad y = -\frac{9}{4} + \frac{9 \cdot 3}{2 \cdot 2} + \frac{4 \cdot 4}{1 \cdot 4} \\
 &\frac{25}{4} - \frac{50}{4} - \frac{32}{4} = -\frac{57}{4} \quad -\frac{9}{4} + \frac{18}{4} + \frac{16}{4} = \frac{25}{4} \\
 &-14.25 \quad -14\frac{1}{4} \quad \quad \quad 6\frac{1}{4} = 6.25 \\
 &v: \left(-2.5, -14.25\right) \quad \quad \quad (1.5, 6.25) \\
 &\quad c = -8 \quad \quad \quad c = 4 \\
 &\quad S/A \quad \quad \quad D/B
 \end{aligned}$$

