

## 8.1 Solving Systems of Equations Graphically

A system of equations is two or more equations, considered together, involving the same variables. The **solution(s)** is all the values of the variables that make each equation true.

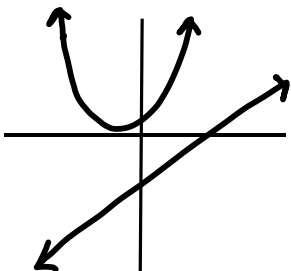
1. **Linear-quadratic system** – A system of equations involving both a linear and quadratic equation involving the **same variables**. A graph of this system involves both a **straight line** and a **parabola**.

2. **Quadratic-quadratic system** – A system of equations involving two quadratic equations involving the **same variables**. A graph of this system involves two **parabolas**.

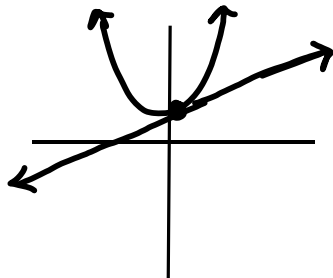
The **solution** to a system of equations from a graph is the point(s) - or ordered pair(s)  $(x, y)$  - where the two graphs **cross**. These are called the **intersection** points.

How many solutions are possible?

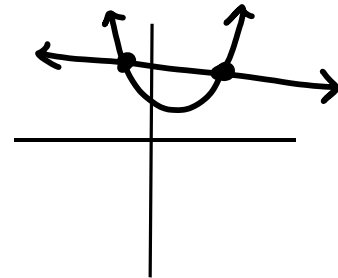
1. Linear-quadratic system



no solution

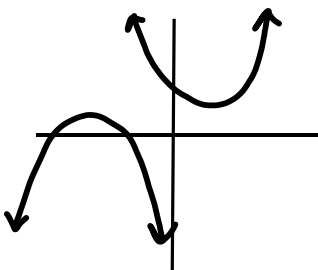


one solution

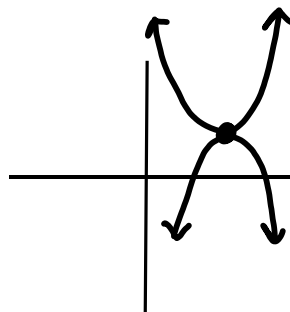


two solutions

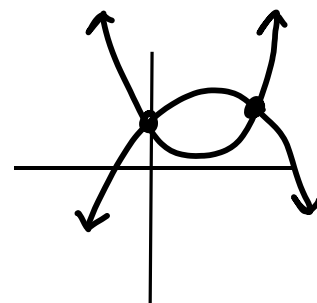
2. Quadratic-quadratic system



no solution



one solution



two solutions

To solve a system of equations graphically:

1. graph each function on same grid
2. find the point(s) of intersection
3. verify the solution

Example: Solve the following system of equations graphically.

$$4x - y + 3 = 0 \quad \textcircled{1}$$

a)  $2x^2 + 8x - y + 3 = 0 \quad \textcircled{2}$

$$\begin{aligned} \textcircled{1} \quad 4x - y + 3 &= 0 \\ 4x + 3 &= y \end{aligned}$$

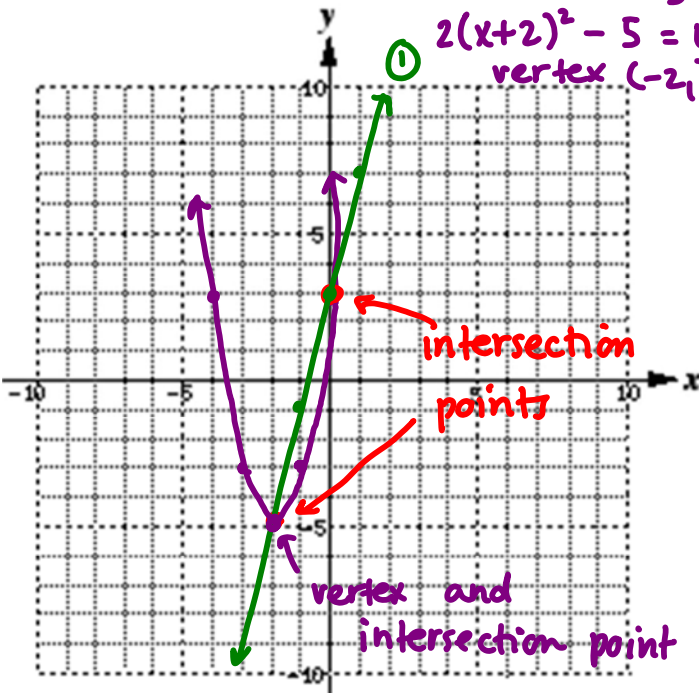
$$\begin{aligned} \textcircled{2} \quad 2x^2 + 8x - y + 3 &= 0 \\ (2x^2 + 8x) + 3 &= y \end{aligned}$$

$$2(x^2 + 4x + \underline{4} - \underline{4}) + 3 = y$$

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

$$\textcircled{2} \quad 2(x+2)^2 - 5 = y$$

vertex  $(-2, -5)$



solution :  $(-2, -5)$   
 $(0, 3)$

b)  $y = x^2 + 2 \quad \textcircled{1}$   
 $y = x^2 - 6x + 8$

$$\textcircled{1} \quad y = x^2 + 2$$

vertex  $(0, 2)$

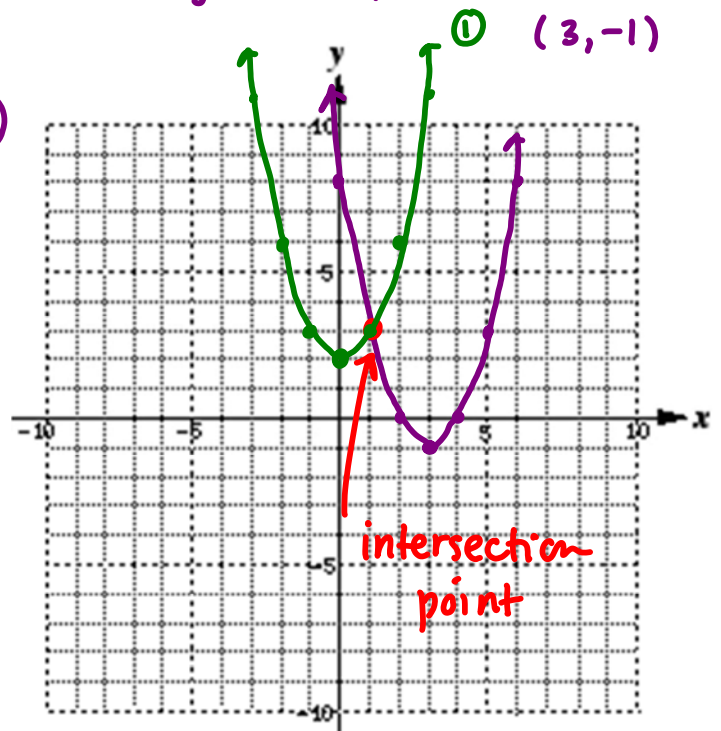
$$\textcircled{2} \quad y = x^2 - 6x + 8$$

$$y = (x^2 - 6x + \underline{9} - \underline{9}) + 8$$

$$y = (x^2 - 6x + 9) + 8 + (-9)$$

$$y = (x-3)^2 - 1 \quad \text{vertex}$$

$(3, -1)$



solution  $(1, 3)$

Practice: p. 435 # 2, 3, 4abc