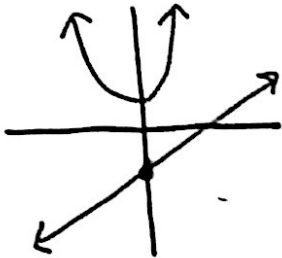


## M2H: Solving Systems of Quadratic Equations Graphically

Def: a system of nonlinear equations is a system where 1 or more equations involved is not a line.

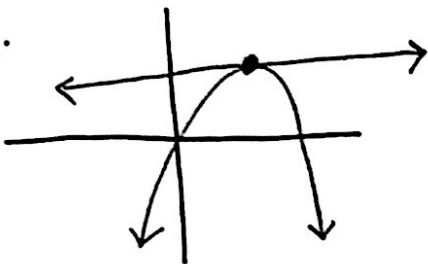
\* could have one, none, two, or several solutions.

Ex.



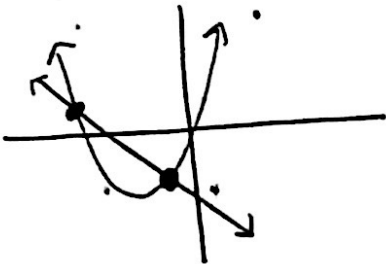
Not intersecting at all  $\rightarrow$  no solution!

Ex.



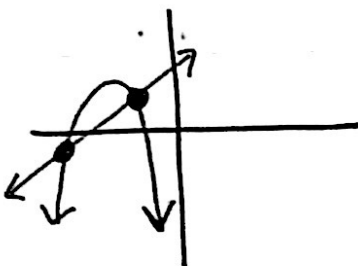
touches at one point  $\rightarrow$  one solution!

Ex.



two points of intersection  $\rightarrow$  2 solutions!

Ex.



2 solutions!

# Solving Quadratic Systems Algebraically

$$\text{Ex) } \begin{cases} y = x^2 + 4x + 3 \\ y - 6 = 2x \end{cases}$$

① solve both equations for y

$$\begin{array}{r} y - 6 = 2x \\ \quad \downarrow \\ y - 6 = 2x \\ \quad +6 \quad \quad +6 \\ \hline y = 2x + 6 \end{array}$$

$$y = x^2 + 4x + 3 \quad y = 2x + 6$$

② set equations equal to each other

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

$$\begin{array}{r} -3 \mid 2 \quad | \quad x^2 + 2x - 3 = 0 \\ -1, 3 \mid \quad \quad \quad \downarrow \quad \downarrow \end{array}$$

$$(x^2 - 1x) + (3x - 3) = 0$$

③ solve by factoring OR quad. formula

$$x(x-1) + 3(x-1) = 0$$

$$x-1=0 \rightarrow x=1$$

$$(x-1)(x+3) = 0$$

$$x+3=0 \rightarrow x=-3$$

④ substitute x (either equation) and solve for y.

$$y = 2x + 6$$

$$x = 1: y = 2(1) + 6 = 8$$

$$\boxed{(1, 8) \quad (-3, 0)}$$

$$x = -3: y = 2(-3) + 6 = 0$$