Today's Learning Goal(s):

By the end of the class, I will be able to:

a) find the point of intersection between a line and a parabola.
b) solve problems involving the intersection of linear and quadratic functions.

3.8 Linear Quadratic Systems

Date: _Mar.27/18_
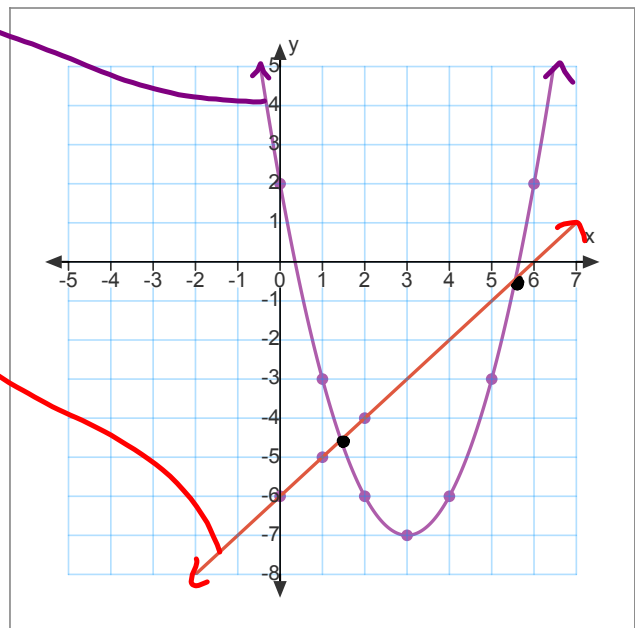
Ex. 1: Consider the followinglinear-quadratic system.

$$y = (x-3)^2 - 7$$ $v(3,-7)$

$$y = x - 6$$

$b = -6$ $m = \dfrac{1}{1}$ $\dfrac{Rise}{Run}$

a) Solve the system by graphing.

the solutions are *approximately*

$(1.5, -4.5)$ and $(5.5, -0.5)$

Ex. 1 (cont'd)

b) Solve the system algebraically.

$$y = (x-3)^2 - 7$$

$$y = x - 6$$

Use Substitution

$$x - 6 = (x-3)^2 - 7$$

$$x - 6 = x^2 - 6x + 9 - 7$$

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

$$0 = x^2 - 7x + 8$$

$$\Rightarrow a = 1 \quad b = -7 \quad c = 8$$

$$x = \frac{-(-7) \pm \sqrt{(-7)^2 - 4(1)(8)}}{2(1)}$$

$$= \frac{7 \pm \sqrt{49 - 32}}{2}$$

$$= \frac{7 \pm \sqrt{17}}{2}$$

$$\therefore x = \frac{7 + \sqrt{17}}{2} \quad \text{or} \quad x = \frac{7 - \sqrt{17}}{2}$$

if $x = \frac{7+\sqrt{17}}{2}$

$$y = x - 6$$

$$= \frac{7+\sqrt{17}}{2} - 6$$

$$= \frac{7+\sqrt{17}}{2} - \frac{12}{2}$$

$$= \frac{-5+\sqrt{17}}{2}$$

if $x = \nearrow$

$$y = \frac{7-\sqrt{17}}{2} - 6$$

$$= \frac{7-\sqrt{17}}{2} - \frac{12}{2}$$

$$= \frac{-5-\sqrt{17}}{2}$$

the **EXACT** solutions are $\left(\dfrac{7+\sqrt{17}}{2}, \dfrac{-5+\sqrt{17}}{2} \right)$ and $\left(\dfrac{7-\sqrt{17}}{2}, \dfrac{-5-\sqrt{17}}{2} \right)$

approx $\left(5.56, -0.43 \right)$ $\left(1.43, -4.56 \right)$

Ex. 2: For what values of m is $y = mx - 2$ tangent
to the parabola defined by $y = -x^2 + 8x - 11$?

$mx - 2 = -x^2 + 8x - 11$

$x^2 - 8x + 11 + mx - 2 = 0$

$x^2 + mx - 8x + 9 = 0$

$x^2 + (m-8)x + 9 = 0$

$a = 1 \quad b = m-8 \quad c = 9$

for the intersection to be a *tangent*
there is ONLY 1 P.O.I.

$b^2 - 4ac = 0$

$(m-8)^2 - 4(1)(9) = 0$

$m^2 - 16m + 64 - 36 = 0$

$m^2 - 16m + 28 = 0$

$(m-2)(m-14) = 0$
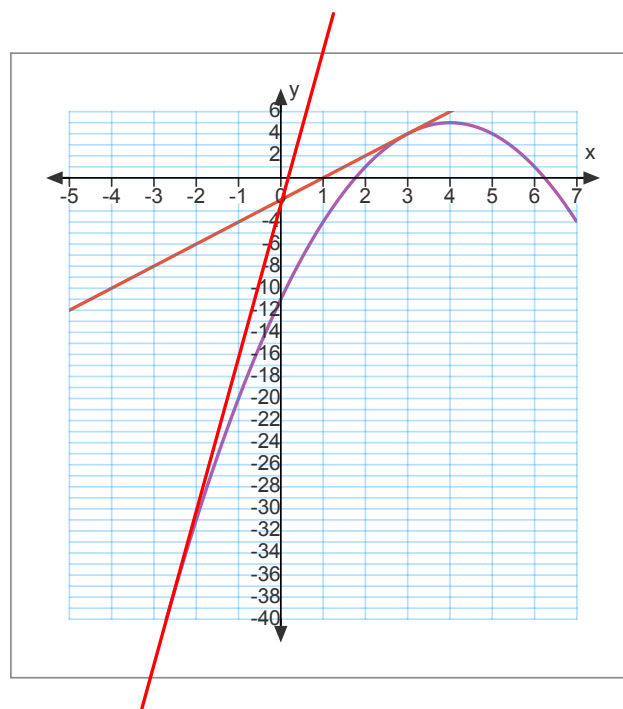
$\therefore m = 2 \qquad \text{or} \qquad m = 14$

$\left[\therefore y = 2x - 2 \quad \text{or} \quad y = 14x - 2 \atop \text{are the equations} \right.$

Ex. 2: (Graphical Check of our Solution)

$y = -x^2 + 8x - 11$ $y = 2x - 2$ $y = 14x - 2$

Are there any Homework Questions you would like to see on the board?

Last day's work: Max/Min Problems Worksheet #2
#1–5, 8 [6, 7]

Today's Homework Practice includes:

pp. 198-199 #1c, 2ac, 3, 4ab, 5 8 [11]