

Today's Learning Goal(s):

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

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

3.8 Linear Quadratic Systems

Date: March 28, 2017

Ex. 1: Consider the following linear-quadratic system.

$$y = (x - 3)^2 - 7 \quad \text{vertex } (3, -7)$$

$$y = x - 6$$

$$b = -6$$

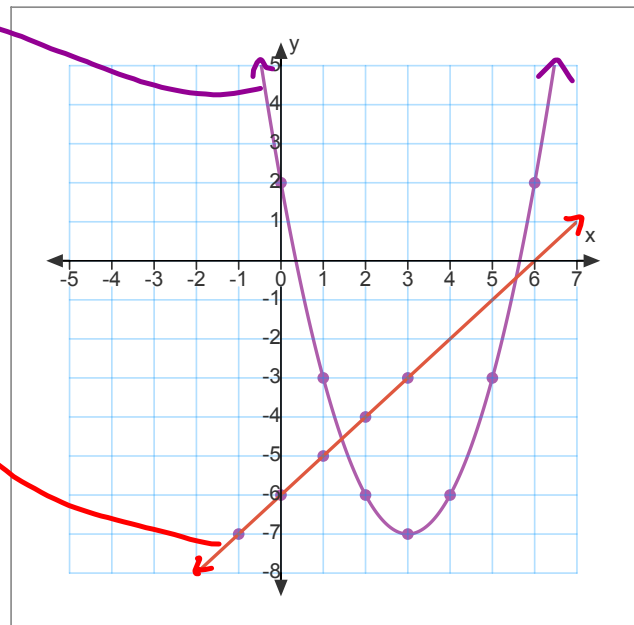
$$m = \frac{1}{1} \quad \begin{array}{l} \text{Rise} \\ \text{Run} \end{array}$$

a) Solve the system by graphing.

the solutions are approximately

$$(1.4, -4.5)$$

$$\text{and } (5.6, -0.5)$$



Ex. 1 (cont'd)

b) Solve the system algebraically.

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

$$y = x - 6$$

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

$$0 = x^2 - 6x + 9 - 7 - x + 6$$

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

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

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

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

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

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

$$y = x - 6$$

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

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

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

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

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

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

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

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

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

\therefore approx solutions $(5.56, -0.43)$ and $(1.44, -4.56)$

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

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

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

$$x^2 - 8x + \underline{mx} + 9 = 0$$

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

$$| x^2 + \underline{(-8+m)x} + \underline{9} = 0$$

for the intersection to be a tangent

$\therefore 1$ P.O.I.

$$\therefore b^2 - 4ac = 0$$

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

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

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

$$(m-14)(m-2) = 0$$

$$\therefore m = 14 \text{ or } m = 2$$

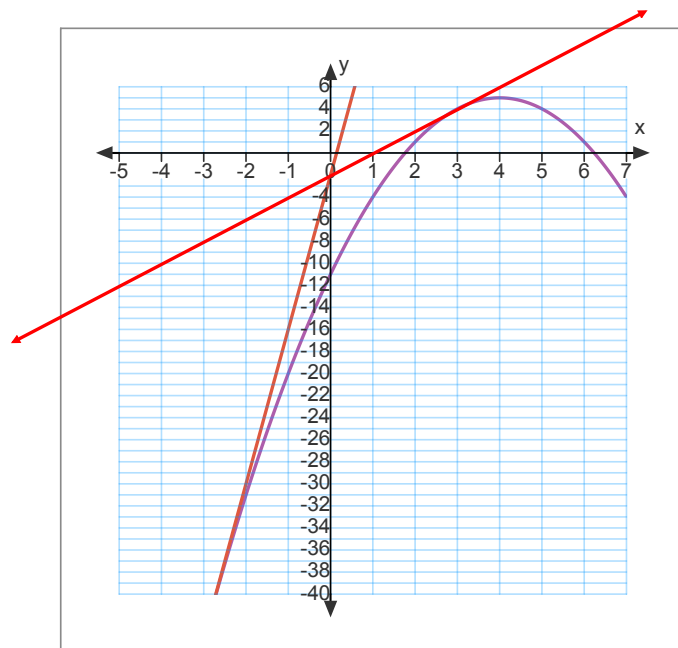
$\therefore y = 14x - 2$ or $y = 2x - 2$
are the eq's of the tangents.

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]