Today's Learning Goal(s):

Date: ____________________

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.

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

1. Two numbers have a difference of 16. Find the numbers if the result of adding their sum and their product is a minimum.

Let l and s represent the larger & smaller numbers respectively.

$l - s = 16 \longrightarrow l = 16 + s$

$R = (l+s) + (ls)$

$= (16+s+s) + (16+s)(s)$

$= 16 + 2s + 16s + s^2$

$= s^2 + 18s + 16$

$s = -\frac{b}{2a}$

$= \frac{-(18)}{2(1)}$

$= -9$

$\therefore l = 16 + s$

$= 16 + (-9)$

$= 7$

$\therefore$ the numbers are 7 and -9

3.8 Linear Quadratic Systems

Date: Mar. 29/19

Ex. 1: Consider the followinglinear-quadratic system.

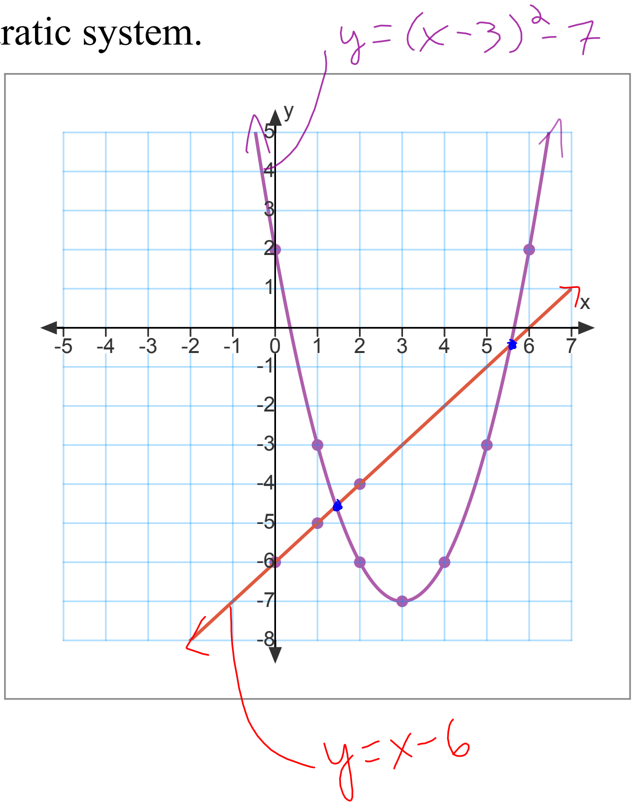
$$y=(x-3)^2-7$$ v(3,-7) a = 1

$$y=x-6$$

b = -6

m = 1

a) Solve the system by graphing.



the solutions are *approximately*

(1.5, -4.5) and (5.6, -0.4)

Ex. 1 (cont'd)

b) Solve the system algebraically. Use substitution

$$y_1 = (x-3)^2 - 7$$

$$y_2 = x - 6$$

$$y_1 = y_2$$

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

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

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

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

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

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

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

$\therefore x = \dfrac{7+\sqrt{17}}{2}$ or $x = \dfrac{7-\sqrt{17}}{2}$

if $x = \nearrow$

$$y = x - 6$$

$$= \left(\frac{7+\sqrt{17}}{2}\right) - 6$$

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

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

$$y = \left(\frac{7-\sqrt{17}}{2}\right) - 6$$

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

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

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. $(5.56, -0.438)$ $\quad (1.438, -4.56)$

(see previous page approximations (they are very close))

Ex. 2: For what values of m is $y_1 = mx - 2$ tangent to the parabola defined by $y_2 = -x^2 + 8x - 11$?

$y_1 = y_2$

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

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

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

$ax^2 + bx + c = 0$

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

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

$b^2 - 4ac = 0$

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

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

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

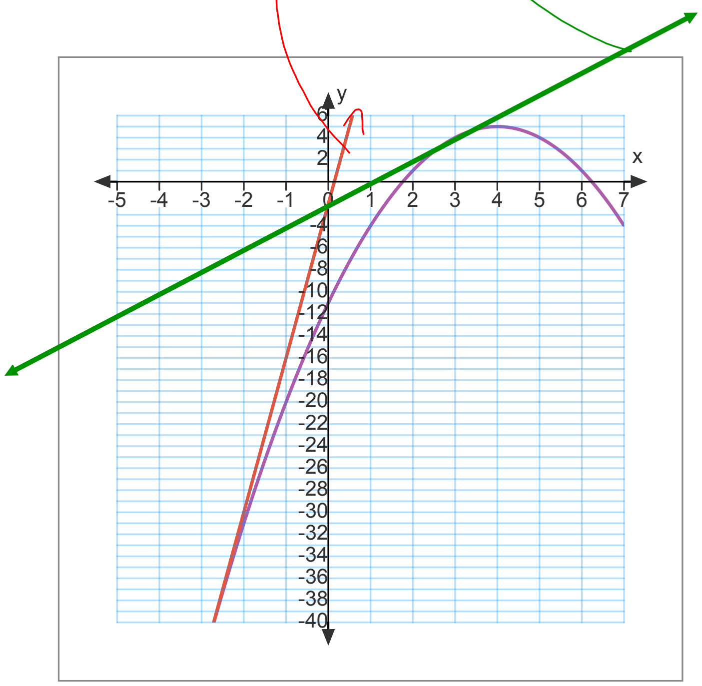
$(m-14)(m-2) = 0$

$\therefore m = 14$ or $m = 2$

[$\therefore y = 14x - 2$ or $y = 2x - 2$ are the equations]

Ex. 2: (Graphical Check of our Solution) (Also Desmos: 3U 3.8 Ex.2)

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



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]