Name: ______________________ Date: ______________________

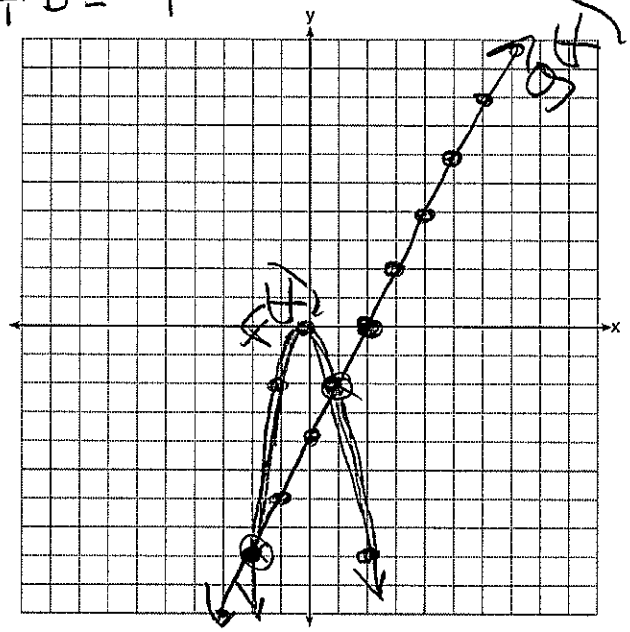
UNIT 9 **LESSON 10**

Do Now

Let $f(x) = -2x^2$ and $g(x) = 2x - 4$. On the set of axes below, draw the graphs of $y = f(x)$ and $y = g(x)$.

$f(x) = -2x^2$ $m = \frac{2}{1}$ $b = -4$

x	f(x)
-3	-18
-2	-8
-1	-2
0	0
1	-2
2	-8
3	-18



POI'S

(1, -2)

(-2, 8)

Using this graph, determine and state *all* values of x for which $f(x) = g(x)$.

$\{1, -2\}$

AIM: SOLVING SYSTEMS

1. Solve the *do now* algebraically and find when $f(x) = g(x)$.

$$-2x^2 = 2x - 4$$
$$+2x^2 \qquad +2x^2$$
$$2x^2 + 2x - 4 = 0$$
$$2(x^2 + x - 2) = 0$$

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

$-2 \neq 0$	$\boxed{x = -2}$	$\boxed{x = 1}$
	$2(-2) - 4$	$2(1) - 4$
	$y = -8$	$y = -2$
	$(-2, -8)$	$(1, -2)$

$\boxed{(-2, 8) \quad (1, -2)}$

2. John and Sarah are each saving money for a car. The total amount of money John will save is given by the function $f(x) = 60 + 5x$. The total amount of money Sarah will save is given by the function $g(x) = x^2 + 46$. After how many weeks, x, will they have the same amount of money saved? Explain how you arrived at your answer.

$$g(x) = f(x)$$
$$x^2 + 46 = 60 + 5x$$
$$-60 \quad -60$$
$$x^2 - 14 = 5x$$
$$-5x \quad -5x$$
$$x^2 - 5x - 14 = 0$$
$$(x-7)(x+2) = 0$$
$$x = 7 \qquad \cancel{x = -2} \text{ reject}$$

$\boxed{\text{After 7 weeks}}$

3. A company is considering building a manufacturing plant. They determine the weekly production cost at site A to be $A(x) = 3x^2$ while the production cost at site B is $B(x) = 8x + 3$, where x represents the number of products, *in hundreds*, and $A(x)$ and $B(x)$ are the production costs, *in hundreds of dollars*. Graph the production cost functions on the set of axes below and label them site A and site B.

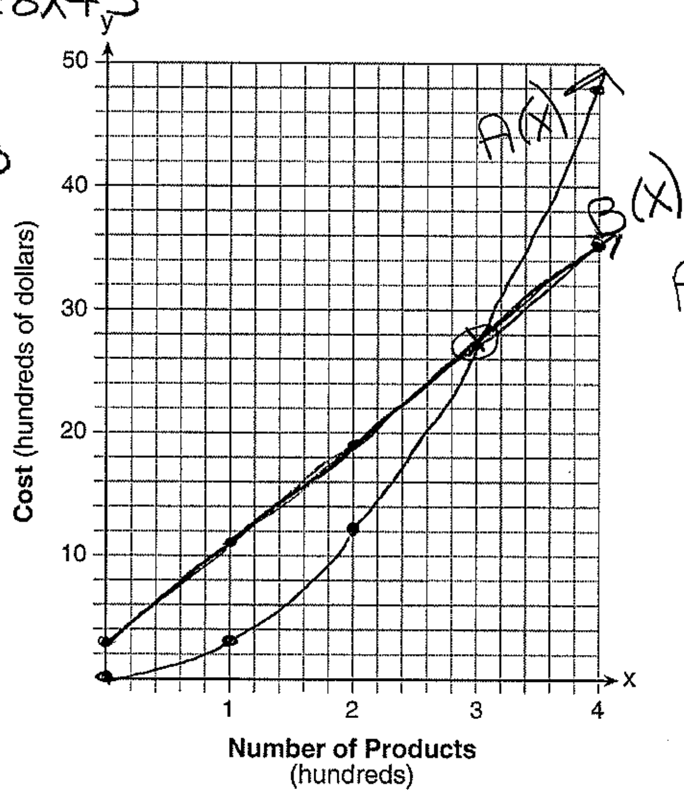
A(x)

x	y
0	0
1	3
2	12
3	27
4	48

$B(x) = 8x + 3$

$m = \frac{8}{1}$

$b = 3$



$A(x) = B(x)$

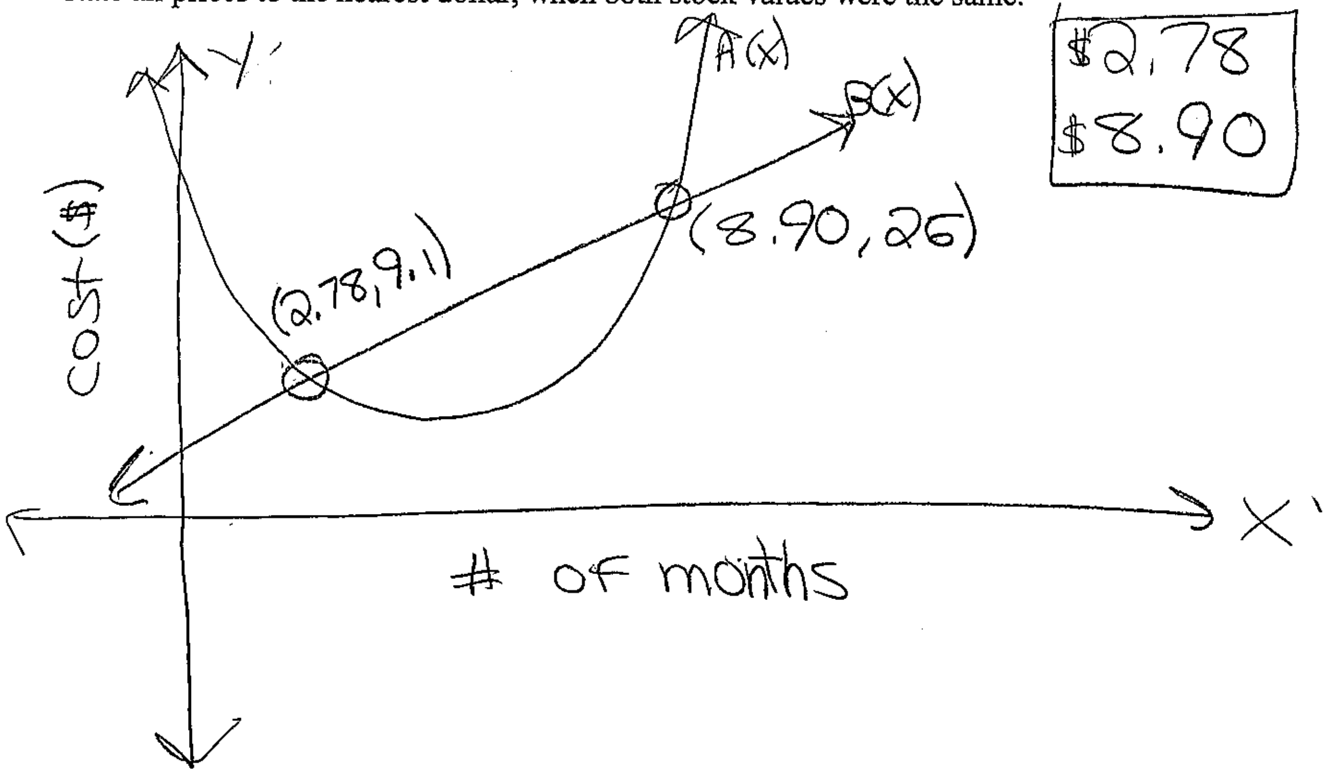
$(3, 27)$

* more room needed

State the positive value(s) of x for which the production costs at the two sites are equal. Explain how you determined your answer. If the company plans on manufacturing 200 products per week, which site should they use? Justify your answer.

$x = 3$ which means that when 300 products are sold, the cost is the same for both sites. This represents the P.O.I.

4. The price of a stock, A(x) over a 12-month period decreased and then increased according to the equation $A(x) = 0.75x^2 - 6x + 20$, where x equals the number of months. The price of another stock B(x), increased according to the equation $B(x) = 2.75x + 1.50$ over the same 12-month period. Sketch both equations and state all prices to the nearest dollar, when both stock values were the same.



*Extra Credit:
For question s#3, find when A(x) = B(x) **ALGEBRAICALLY**

$A(x) = 3x^2$

$B(x) = 8x + 3$

$3x^2 = 8x + 3$

$3x^2 - 8x - 3 = 0$

$3x^2 - 9x + 1x - 3 = 0$

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

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

$\boxed{x = 3}$ $\cancel{x = -\frac{1}{3}}$

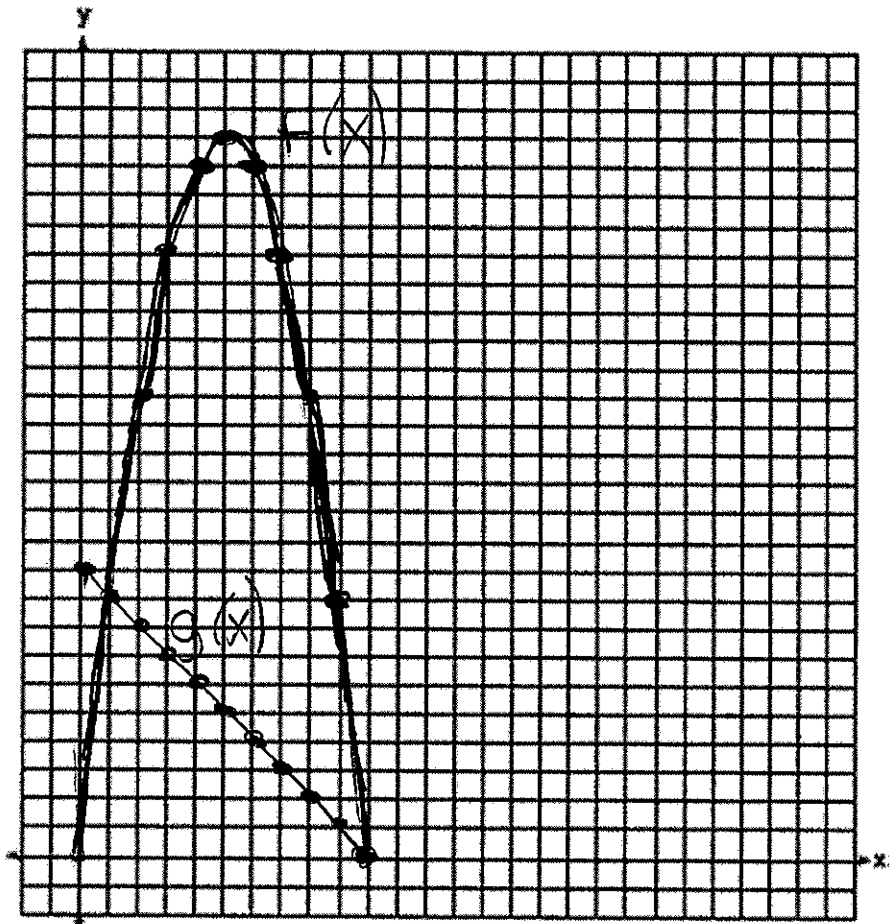
m = -9
c = -8

Extra Credit

1. A rocket is launched from the ground and follows a parabolic path represented by the equation $f(x) = -x^2 + 10x$. At the same time, a flare is launched from a height of 10 feet and follows a straight path represented by the equation $g(x) = -x + 10$. Using the accompanying set of axes, graph the equations that represent the paths of the rocket and the flare and find the coordinates of the point or points where the paths intersect.

$f(x)$

x	y
0	0
1	9
2	16
3	21
4	24
$\boxed{5}$	$\boxed{25}$
6	24
7	21
8	16
9	9
10	0



$g(x) = -x + 10$

$m = \frac{-1}{1}$

$b = 10$

$\boxed{(1, 9) ; (10, 0)}$

2. Algebraically, state all values for x when $f(x) = g(x)$.

$$-x^2 + 10x = -x + 10$$
$$+x \qquad +x$$
$$-x^2 + 11x = 10$$
$$-10 \qquad -10$$
$$\frac{-x^2}{-1} + \frac{11x}{-1} - \frac{10}{-1} = \frac{0}{-1}$$
$$x^2 - 11x + 10 = 0$$
$$(x - 10)(x - 1) = 0$$

$\boxed{x = 10}$ | $\boxed{x = 1}$

$-(10) + 10$ | $-(1) + 10$

$\boxed{y = 0}$ | $\boxed{y = 9}$

$\boxed{(10, 0) \quad (1, 9)}$