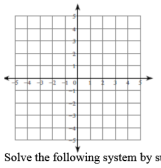
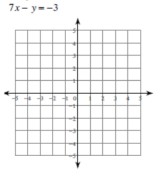
Cholkar MCHS MATH II ___/___/___ Name _____

U5L2INV2	How do we solve equations that involve both linear and quadratic equations?
HW #	Complete Handout **[1, 3, 5, 8, 10]**
Do Now	Solve the following system of linear equations by graphing. $y = -3x + 4$ $y = 3x - 2$  $x - y = 3$ $7x - y = -3$  Solve the following system by substitution. $4x + 2y = 10$ $x - y = 13$

STOP

INVESTIGATION: MAKING MORE BY CHARGING LESS (pg. 364)

My role for this investigation _____

1. **Relationship between Ticket Price and Ticket Sales**

Price (in dollars)	5	10	15	20	30	40
Tickets Sold	2,300	2,000	1,700	1,500	1,050	500

a. $s(p) = 2{,}500 - 50p$

i. What do p and $s(p)$ represent in that function? _____

ii. Is that function reasonable? Can you produce a better model?

_____

b. What do the numbers 2,500 and -50 tell about the way ticket sales depend on ticket price?

_____

2. $I(p) = p(2{,}500 - 50p)$

a. Test this function rule by calculating the predicted income from ticket sales in two ways.

i. First, use the data in Problem 1 to estimate income if the ticket price is set at $10, $20, $40.

_____

ii. Then use the function to calculate predicted ticket income for the same ticket prices.

_____

b. Sarren proposed the function $I(p) = 2{,}500p - 50p^2$ for predicting income from ticket price. Is this equivalent to $I(p) = p(2{,}500 - 50p)$? Why or why not?

_____

3. $c(s) = 17{,}500 + 2s$

a. According to the rule, what are the fixed operating costs and the costs per customer?

_____

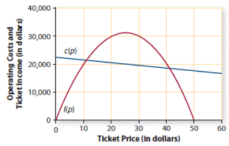
b. Daniel proposed the rule $c(p) = 17{,}500 + 2(2{,}500 - 50p)$. Is this correct? Why or why not?

_____

c. Minta suggested the expression $17{,}500 + 2(2{,}500 - 50p)$ in part b could be simplified to $22{,}500 - 100p$. Is this correct? Why or why not?

_____

4. The following graph shows how income and operating cost depend on ticket price and how they are related to each other.



a. Use the graph to estimate answers for the following questions, and explain how you arrive at each estimate.

i. For what ticket price(s) will operating cost exceed income? _____

ii. For what ticket price(s) will income exceed operating cost? _____

iii. For what ticket price(s) will income equal operating cost? _____

b. Write an equation that helps in locating the **break-even point(s)**-the ticket prices for which income exactly equals operating cost.

_____

5. It is likely that the show producers wan to do more than break-even. They will probably seek maximum profit.

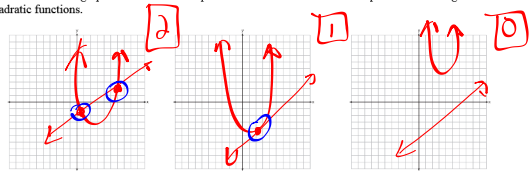
a. _____

b. _____

c. $y = mx + b$ $y = ax^2 + bx + c$

6. Explore equations in the form $mx + d = ax^2 + bx + c$.

a. Sketch function graphs that illustrate the possible number of solutions for equations involving linear and quadratic functions.



b. Solve each of the following equations using factoring or the quadratic formula.

i. $x^2 - x + 3 = 2x - 1$

$y = 2x - 1$ No solution

$y = x^2 - x + 3$

$x^2 - x + 3 = 2x$

$-2x + 1 \quad -2x + 1$

$x^2 - 3x + 4 = 0$

$x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(1)(4)}}{2} \rightarrow \frac{3 \pm \sqrt{-7}}{2}$

ii. $x^2 - 3x + 2 = x - 2$

$-x + 2 \quad -x + 2$

$x^2 - 4x + 4 = 0$

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

$x - 2 = 0$

$x = 2$

$y = 2 - 2$

$y = 0$

iii. $10x^2 - 28x - 39 = 2x - 1$

$-2x + 1 \quad -2x + 1$

$10x^2 - 30x - 40 = 0$

$\frac{10}{10}$

$10(x^2 - 3x - 4) = 0$

$10(x-4)(x+1) = 0$

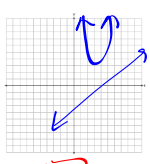
$x = 4 \quad x = -1$

$2(4) + 1 = 9 \quad 2(-1) + 1 = -1$

$(4, 9) \quad (-1, -1)$

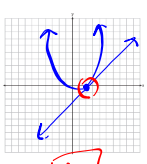
c. Sketch graphs of the linear and quadratic functions involved in part b and explain how the graphs illustrate the solutions.

i.



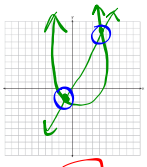
0

ii.



1

iii.



2

Lesson Summary	In this investigation, you developed strategies for solving problems that involve combinations of linear and quadratic functions. What strategy would you use to solve a system of equations of the form $y = mx + d$ and $y = ax^2 + bx + c$? What are the possible numbers of solutions for equations in the form $mx + d = ax^2 + bx + c$?

Math Toolkit Vocabulary: break-even, linear functions, quadratic functions

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HW #

Solve each of these equations, sketch graphs showing the functions involved, and label points corresponding to solutions with their coordinates.

1. $x+2=x^2+3x-6$

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

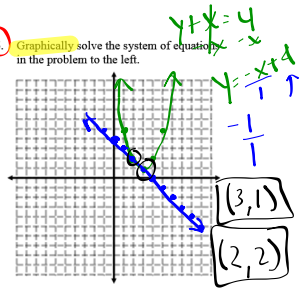
3. $2x+3=4-x^2$

4. $2x^2-x=3x+16$

5. Solve the following system algebraically:

$$\begin{cases} y=x^2-6x+10 \\ y+x=4 \end{cases}$$

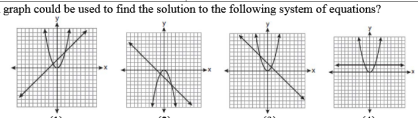
6. Graphically solve the system of equations in the problem to the left.



7. Which graph could be used to find the solution to the following system of equations?

$y=-x+2$

$y=x^2$



(1) (2) (3) (4)

REVIEW:

8. The graph of $y=ax^2$ is shifted up 3 units and right 5 units. Which equation represents the resulting graph?

a. $y=a(x-5)^2+3$

b. $y=a(x+5)^2+3$

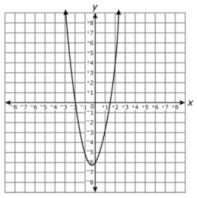
c. $y=a(x-3)^2+5$

d. $y=a(x+3)^2+5$

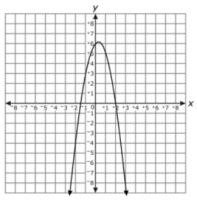
9.

9. Which graph displays the function $f(x)=(2x+3)(x-2)$?

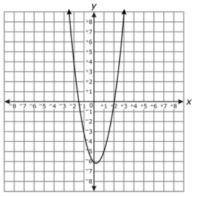
a.



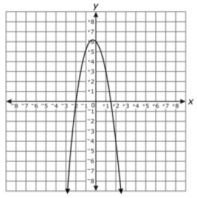
c.



b.



d.



10. The height of a swimmer's dive off a 10-foot platform into a diving pool is modeled by the equation $y=2x^2-12x+10$, where x represents the number of seconds since the swimmer left the diving board and y represents the number of feet above or below the water's surface. What is the farthest depth below the water's surface that the swimmer will reach?

a. 6 feet

b. 8 feet

c. 10 feet

d. 12 feet