Mathematical Modeling Review

Algebra 2 Name Bonanni ID: 1

Geometric Sequences and Series Review

Date _____ Period ____

Determine if the sequence is geometric. If it is, find the common ratio.

1) –4, –16, –64, –256, ...

yes; $r = 4$

2) 1, –4, 16, –64, ...

yes; $r = -4$

3) 3, 18, 108, 648, ...

yes; $r = 6$

4) –2, 8, –32, 128, ...

yes; $r = -128$

Find the three terms in the sequence after the last one given.

5) 4, –24, 144, –864, ...

5,184; -31,104; 186,624

6) –3, 15, –75, 375, ...

-1875; 9,375; -46,875

7) –0.2, –1, –5, –25, ...

-125; -625; -3,125

8) –3, 18, –108, 648, ...

-3,888; 23,328; -139,968

Find the term named in the problem.

9) 1, 2, 4, 8, ...
Find a_9

$a_n = 1(2)^{9-1}$

$a_9 = 256$

10) 4, 12, 36, 108, ...
Find a_{12}

$a_{12} = 4(3)^{12-1}$

$a_{12} = 708,588$

11) –16, –8, –4, –2, ...
Find a_{12} $r = \frac{1}{2}$

$a_{12} = -16\left(\frac{1}{2}\right)^{12-1}$

$a_{12} = \frac{-1}{128}$

12) 3, 2, $\frac{4}{3}$, $\frac{8}{9}$, ...
Find a_{10} $r = \frac{2}{3}$

$a_{10} = 3\left(\frac{2}{3}\right)^{10-1}$

$a_{10} = \frac{512}{6561}$

Determine if the sequence is geometric. If it is, find the explicit formula.

13) 1, 2, 4, 8, ...

$a_1 = 1 \quad r = 2$

$a_n = 1(2)^{n-1}$

14) 1, 5, 25, 125, ...

$a_1 = 1 \quad r = 5$

$a_n = 1(5)^{n-1}$

Evaluate the related series of each sequence.

15) 1, –2, 4, –8 $a_1 = 1 \quad r = -2 \quad n = 4$

$S_4 = 1\left(\frac{1-(-2)^4}{1-(-2)}\right)$

$S_4 = -5$

16) 1, 5, 25, 125 $a_1 = 1 \quad r = 5 \quad n = 4$

$S_4 = 1\left(\frac{1-(5)^4}{1-5}\right)$

$S_4 = 156$

Evaluate each geometric series described.

17) $a_1 = -1,\ a_9 = -390625,\ r = -5$ $n = 9$

$S_9 = -1\left(\frac{1-(-5)^9}{1-(-5)}\right)$

$S_9 = 325{,}521$

18) $a_1 = 1,\ a_9 = 390625,\ r = 5$ $n = 9$

$S_9 = 1\left(\frac{1-(5)^9}{1-5}\right)$

$S_9 = 488{,}281$

19) $a_1 = 3,\ a_9 = 196608,\ r = 4$ $n = 9$

$S_9 = 3\left(\frac{1-(4)^9}{1-4}\right)$

$S_9 = 262{,}143$

20) $4 - 12 + 36 - 108\ldots,\ n = 6$ $a_1 = 4 \quad r = -3$

$S_6 = 4\left(\frac{1-(-3)^6}{1-(-3)}\right)$

$S_6 = -728$

21) $3 + 15 + 75 + 375\ldots,\ n = 7$ $a_1 = 3 \quad r = 5$

$S_7 = 3\left(\frac{1-(5)^7}{1-5}\right)$

$S_7 = 58{,}593$

22) $3 - 18 + 108 - 648\ldots,\ n = 7$ $a_1 = 3 \quad r = -6$

$S_7 = 3\left(\frac{1-(-6)^7}{1-(-6)}\right)$

$S_7 = 119{,}973$

23) $\sum_{n=1}^{9} (-5)^{n-1}$ $a_1 = 1 \quad r = -5 \quad n = 9$

$S_9 = 1\left(\frac{1-(-5)^9}{1-(-5)}\right)$

$S_9 = 325{,}521$

24) $\sum_{i=1}^{8} (-4)^{i-1}$ $a_1 = 1 \quad r = -4 \quad n = 8$

$S_8 = 1\left(\frac{1-(-4)^8}{1-(-4)}\right)$

$S_8 = -13{,}107$

25) $\sum_{i=1}^{10} 3 \cdot (-4)^{i-1}$ $a_1 = 3 \quad r = -4 \quad n = 10$

$S_{10} = 3\left(\frac{1-(-4)^{10}}{1-(-4)}\right)$

$S_{10} = -629{,}145$

Algebra II
Linear Programming

Name:

The feasible region for a set of constraints has vertices at (2,0), (10,1), (8,5), and (0,4). Given this feasible region, find the maximum and minimum values of each objective function. State the value and where it occurs. **SHOW ALL WORK!**

1. f (x,y) = 4x + y

(2,0)	8
(10,1)	41
(8,5)	37
(0,4)	4

Maximum: 41 @ (10,1)

Minimum: 4 @ (0,4)

2. f (x,y) = 2x – 3y

(2,0)	4
(10,1)	17
(8,5)	1
(0,4)	-12

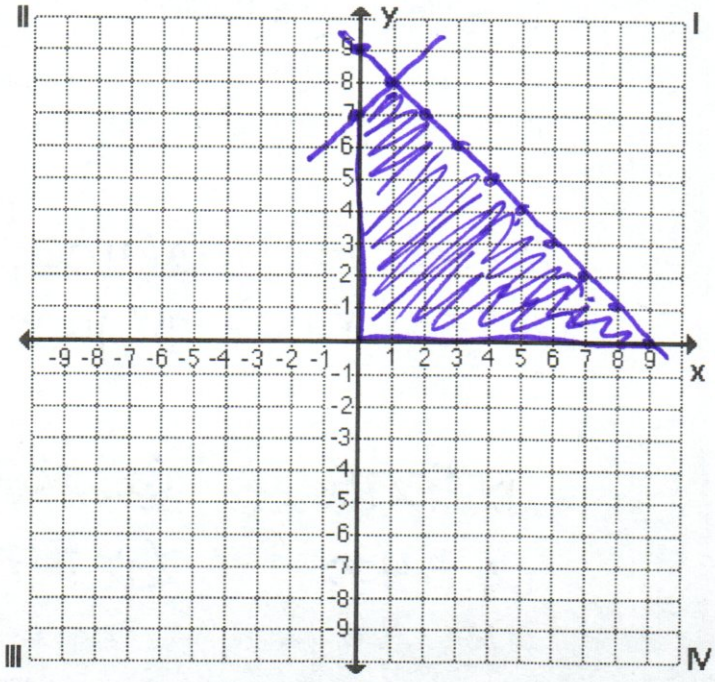
Maximum: 17 @ (10,1)

Minimum: -12 @ (0,4)

Find the maximum and minimum values, if they exist, of each objective function for the given constraints. **SHOW ALL WORK!**

3. f (x,y) = 4x + 8y

Constraints: $x + y \leq 9$ $\quad y \leq -x+9$
$y - x \leq 7$ $\quad y \leq x+7$
$x \geq 0$
$y \geq 0$



(9,7)	56
(1,8)	68
(0,0)	0
(9,0)	36

Maximum: 68 @ (1,8)

Minimum: 0 @ (0,0)

Algebra 2 Linear Programming Project Name:

Apple/Peach Farm Problem

Mrs. Smith grows peaches and apples. At least 500 peaches and 700 apples must be picked daily to meet minimum demands from her buyers. The workers can pick no more than 1400 peaches and 1200 apples daily. The combined number of peaches and apples that the packaging department can handle is 2300 a day. If Mrs. Smith sells her apples for $.25 each and peaches for $.20 each, how many of each should be picked daily for maximum income? What is the maximum income?

1. Define your variables.

X = peaches

Y = apples

2. Write the objective function.

I (Income) = $.20x + .25y$

3. Write the constraints for the problem.

$x \geq 500$ $x \leq 1400$ $x + y \leq 2300$

$y \geq 700$ $y \leq 1200$

4. Graph each of the constraints above on graph paper. Use a unit scale of 1 block =100. Shade in the feasible region. Be neat!!!

5. Name the vertices of the feasible region of your graph.

① (500, 700) ③ (1100, 1200) ⑤ (1400, 900)

② (500, 1200) ④ (1400, 700)

6. Use the objective function with the vertices indicated above to find each value. Show your work below.

① $275 ③ $520 ⑤ $505

② $460 ④ $455

7. Which coordinates will give the maximum profit and what is the maximum profit?

(1100, 1200) $520

8. On a separate sheet of paper, write a business proposal (paragraph) explaining your recommendations to be able to make the maximum profit. Indicate how much of each item should be sold and how much profit could be made. Use the information found in step 6 to support your recommendation and to reject the other possibilities. This should be neat and professional so check your grammar and spelling.

Mrs. Smith should pick 1100 peaches & 1200 apples to make a maximum income of $520.

Algebra 2 Linear Programming Project Name:

Muffin Problem

Baking a tray of corn muffins takes 4 c milk and 3 c wheat flour. A tray of bran muffins requires 2 c milk and 3 c wheat flour. A baker has 16 c milk and 15 c wheat flour available. If each tray of corn muffins makes a profit of $3 and each tray of bran muffins makes a profit of $2, how many trays of each type of muffin should the baker make to maximize profits?

1. Define your variables.

   X = Corn

   Y = ~~oatmeal~~ bran

2. Write the objective function.

   P (profit) = $3x+2y$

3. Write the constraints for the problem.

   $4x+2y \leq 16$ $x \geq 0$ → $y \leq -2x+8$

   $3x+3y \leq 15$ $y \geq 0$ → $y \leq -x+5$

4. Graph each of the constraints above on graph paper. Use a unit scale of 1 block = 1. Shade in the feasible region. Be neat!!!

5. Name the vertices of the feasible region of your graph.

   ① (0,0) ③ (0,5)

   ② (3,2) ④ (4,0)

6. Use the objective function with the vertices indicated above to find each value. Show your work below.

   ① $0 ③ $10

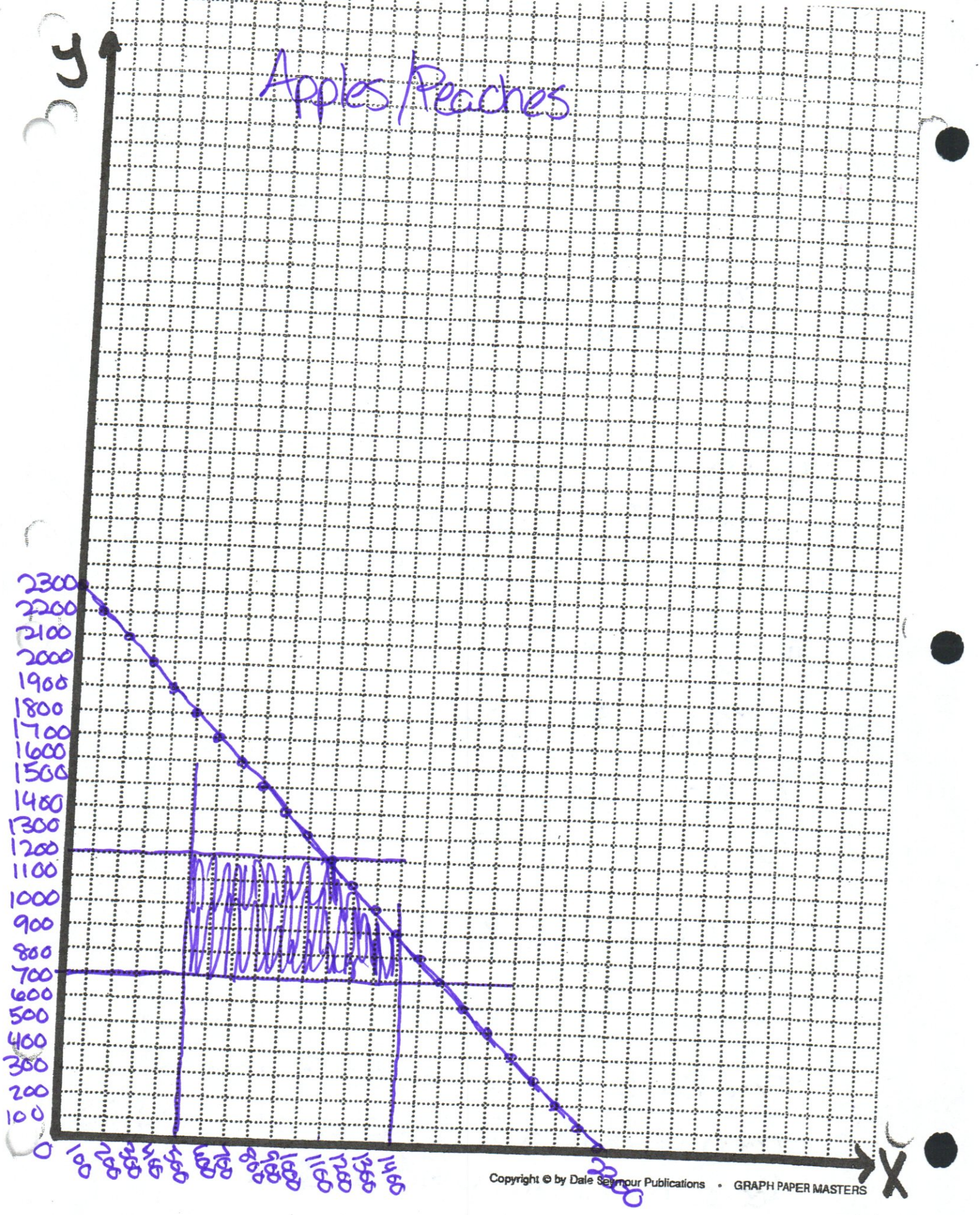
   ② $13 ④ $12

7. Which coordinates will give the maximum profit and what is the maximum profit?

   (3,2) $13

8. On a separate sheet of paper, write a business proposal (paragraph) explaining your recommendations to be able to make the maximum profit. Indicate how much of each item should be built and how much profit could be made. Use the information found in step 6 to support your recommendation and to reject the other possibilities. This should be neat and professional so check your grammar and spelling.

The baker should make 3 trays of corn muffins + 2 trays of bran muffins for a maximum profit of $13.


Apples/Peaches
y
x
2300
2200
2100
2000
1900
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
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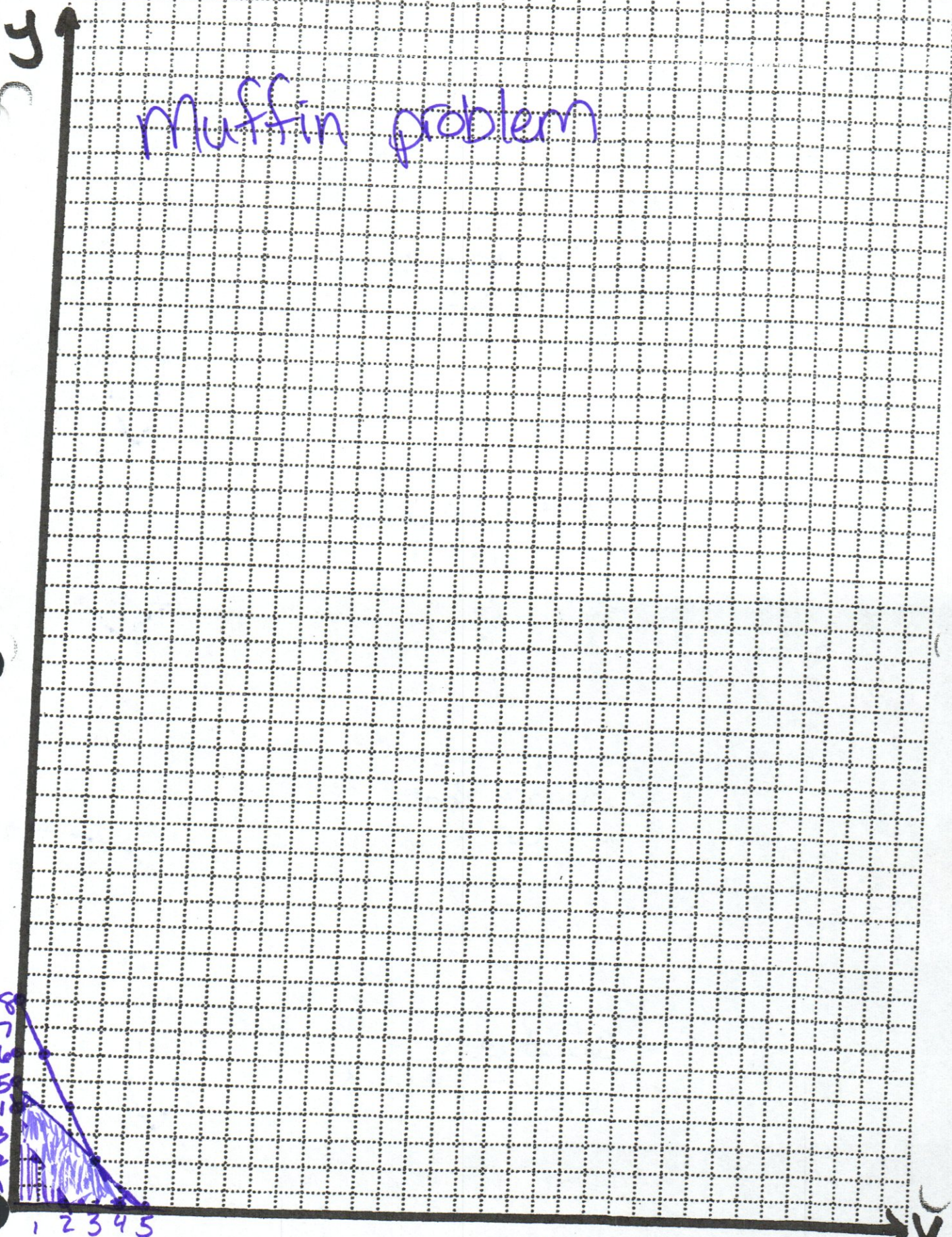
muffin problem



Algebra II: Translations on Parent Functions Review

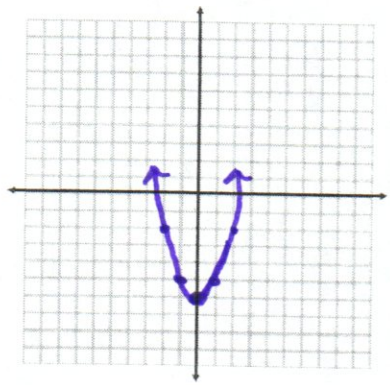
Name _____ Period _____ Date _____

For problem 1- 6, please give the name of the parent function and describe the transformation represented.

1. $g(x) = x^2 - 6$

Parent: Quadratic

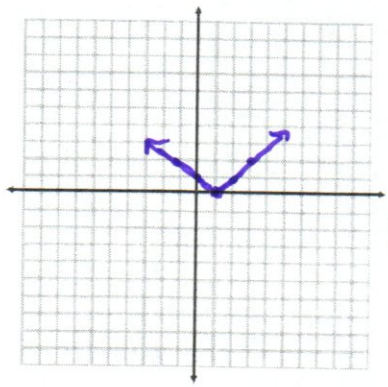
Transformations: down 6



2. $f(x) = |x-1|$

Parent: Absolute Value

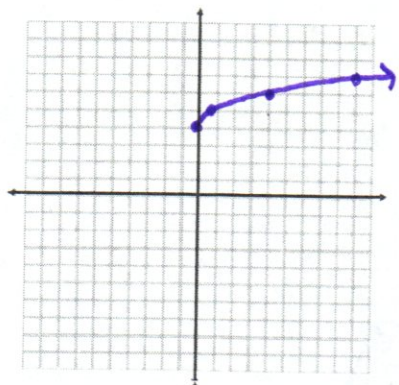
Transformations: right 1



3. $h(x) = \sqrt{x} + 4$

Parent: Square Root

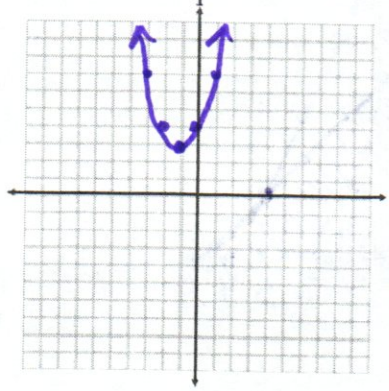
Transformations: up 4



4. $g(x) = (x+1)^2 + 3$

Parent: Quadratic

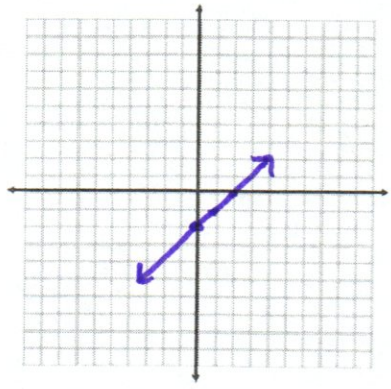
Transformations: left 1 & up 3



5. g(x) = $x-2$

Parent: Linear

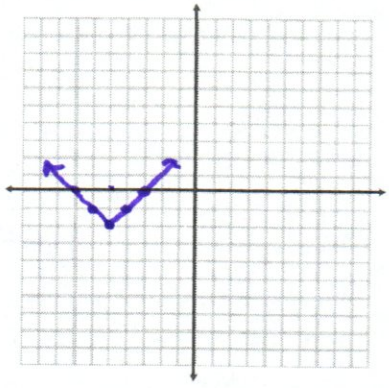
Transformations: down 2



6. f(x) = $|x+5|$ - 2

Parent: Absolute Value

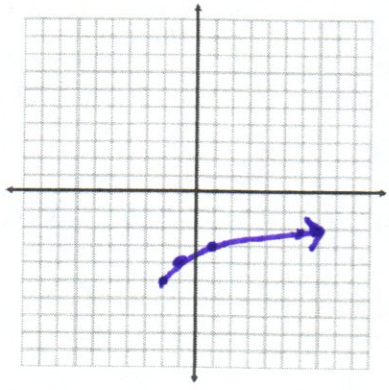
Transformations: left 5 & down 2



7. h(x) = $\sqrt{x+2}-5$

Parent: Square Root

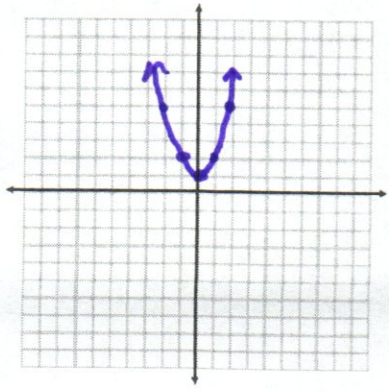
Transformations: left 2 + down 5



8. h(x) = x^2 + 1

Parent: Quadratic

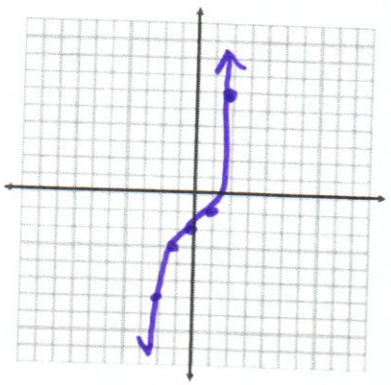
Transformations: up 1



9. $h(x) = x^3 - 2$

Parent: Cubic

Transformations: Down 2



For problems 10 – 14, given the parent function and a description of the transformed function, f(x).

K=-5 h=3

10. Absolute value—vertical shift down 5, horizontal shift right 3. $y = |x-3| - 5$

11. Linear—vertical shift up 5. $y = x + 5$

K=5

12. Square Root —vertical shift down 2, horizontal shift left 7. $y = \sqrt{x+7} - 2$

K=-2 h=-7

13. Quadratic— horizontal shift left 8. $y = (x+8)^2$

h=-8

14. Quadratic—vertex at (-5, -2). $y = (x+5)^2 - 2$

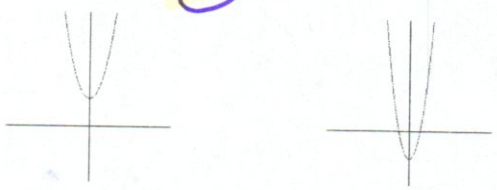
h K

For problems 15 & 16, circle the graph that best represents the given function.

15. $f(x) = x^2 - 2$? down 2

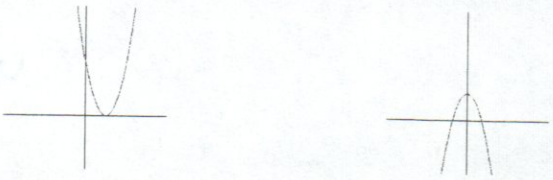
a.

b.



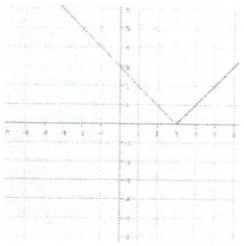
c.

d.

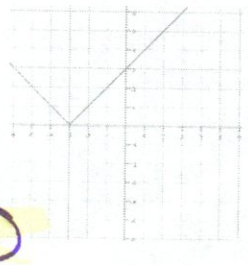


16. $g(x) = |x+3|$? left 3

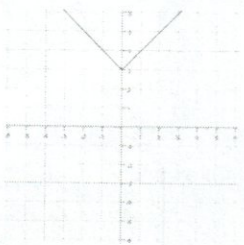
a.



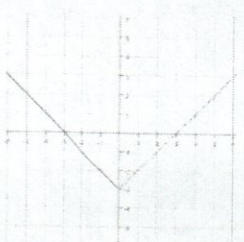
b.



c.

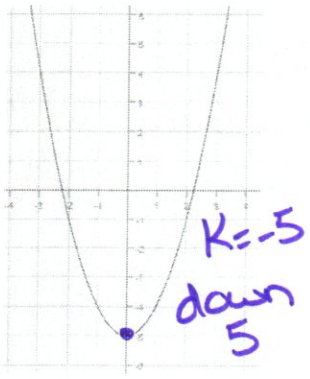


d.

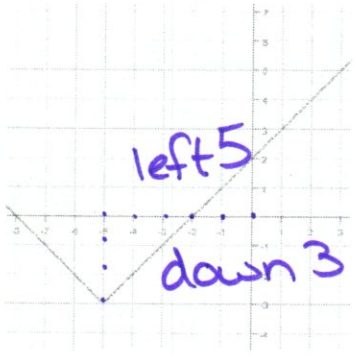


Write the equation for the following translations of their particular parent graphs. You may use y= or function notation (the f(x) type notation).

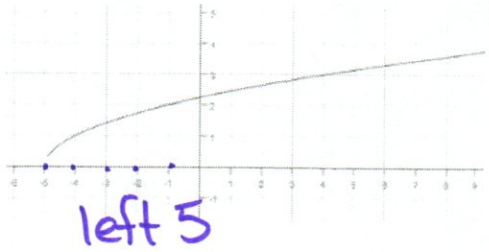
17. $y=x^2-5$



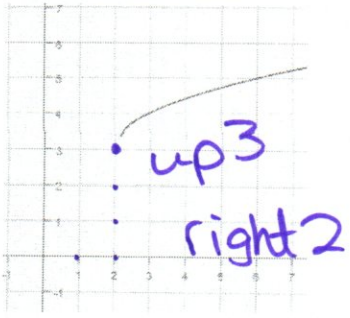
18. $y=|x+5|-3$



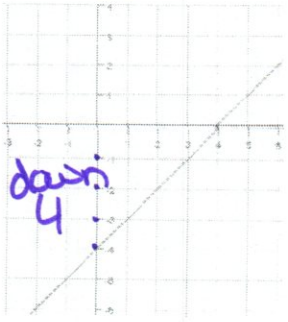
19. $y=\sqrt{x+5}$



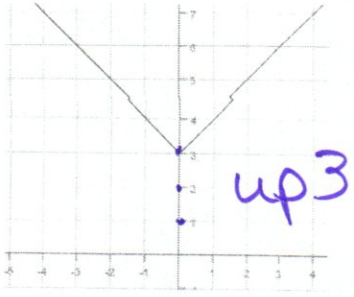
20. $y=\sqrt{x-2}+3$



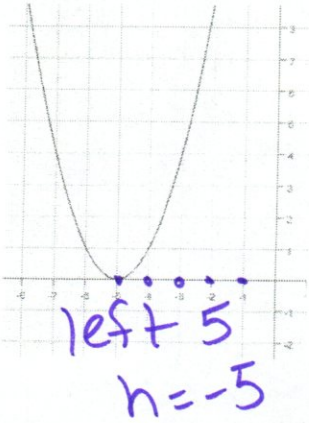
21. $y=x-4$



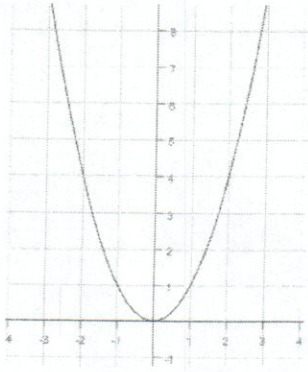
22. $y=|x|+3$



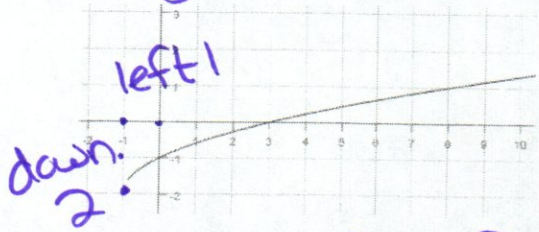
23. $y=(x+5)^2$



24. $y=x^2$



25. $y=\sqrt{x+1}-2$



h=-1 K=-2