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Algebra 1 Midterm Review

Basic Functions
A plumber charges $35 up front for a service call plus $20 per hour for labor.

The total amount charged to the customer, *C*, for a job that that takes *h* hours can be represented by a relation.

    1. Describe the domain: _____

    2. Describe the range: _____

    3. Write an equation to model the total amount charged to the customer, *C*, for a job that
        takes *h* hours

            Equation: _____

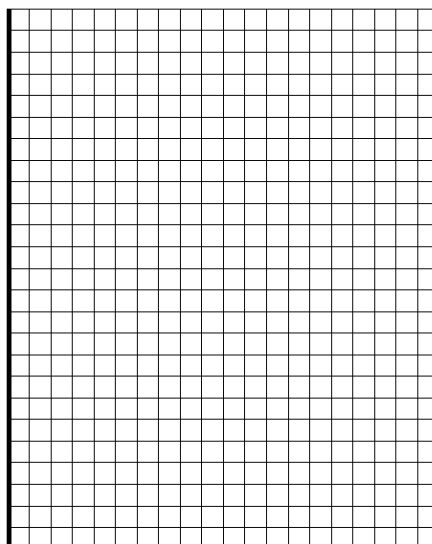   4. How much will it cost for a 3 hour service call? _____

A cupcake delivery company charges $3 per cupcake.

    5. Write an equation to model the total cost, *y*, of delivering *x* cupcakes:_____

    6. Complete the table.

x (number of cupcakes)	1	5	8	10	16
y (total cost)					

    7. Graph the scenario. **Be sure to label!**
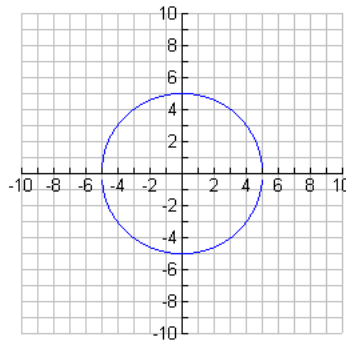
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Determine if the follow relations are functions or non-functions. Circle the appropriate answer.
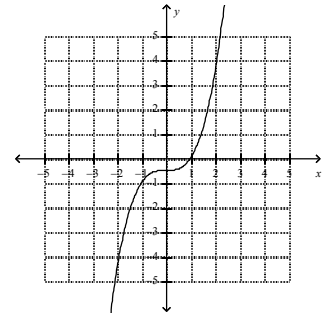
10.

$$\{(0,5),(1,5),(2,6),(4,7)\}$$

function / non-function

11.

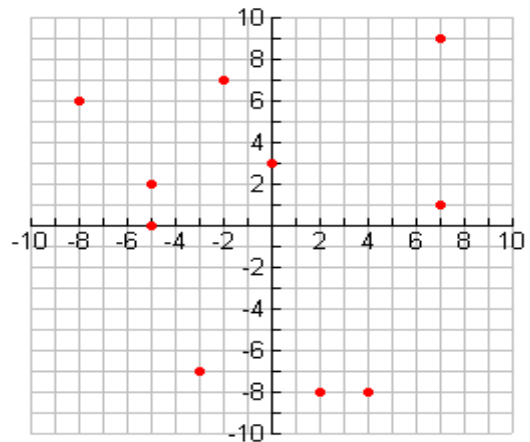function / non-function

12.

function / non-function

13.

x	y
-2	6
-1	8
0	10
1	12

function / non-function

14.

x	y
-3	7
-2	9
-1	11
0	13
-1	15
-2	17

function / non-function

15. The graph to the right is currently not a function. Describe what changes you could make so that it is a function.

Given the function $f(x) = 4x - 8$ Show your work for full credit

16. Find $f(2) =$ _____

17. What is the value of x when $f(x) = 12$? _____

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Evaluating, Order of Operationss, Similar Terms, Solving Equations

I. Evaluate each of the following expressions if $x = -2$, $y = 3$, $and\ z = -4$. Show all work!

      $a)\ (-2xz)^2$ $b) -3xy^2z$ $c)\ \dfrac{54x^2}{6}$

II. Simplify using order of operations. Show all work!

      $a)\ 14 - 7(2 - 4)$ $b)\ (-3)^2 - 5(6 \div 2)^2$ $c)\ 4^3 \div (6 - 4)^2 - 6$

III. Combine similar terms. Show all work!

      $a)\ 4y^3 + 2y - y + y^3 + y^2$ $b)\ 4(9 - x) - 2(x + 7)$ $c)\ (6x - 2) - (3 - 2x)$

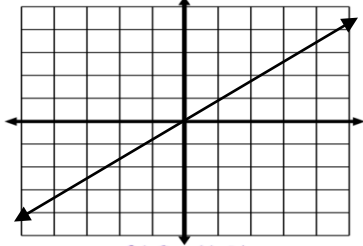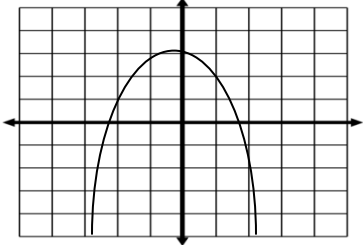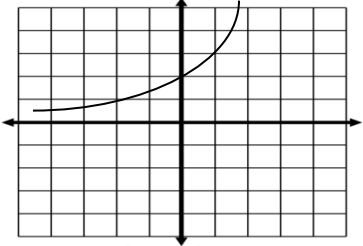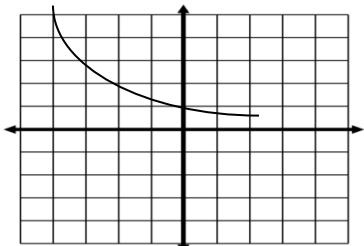IV. Solve each of the following. Show all work!

$a)\ 3 - 10d = 43$ $b)\ 18 = \dfrac{x}{2} - 9$ $c)\ \dfrac{3}{4} - \dfrac{x}{5} = \dfrac{7}{4}$

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Families of Functions

Label as an EXPONENTIAL, LINEAR or QUADRATIC function

1. _____	2. _____
$f(x) = 22x^2 - 14x + 99$	
3. _____	4. _____
	$f(x) = 22(99)^x$
5. _____	6. _____
$g(x) = 6$	
7. _____	8. _____
$f(x) = -\dfrac{1}{22}(x-14)$	

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Use this function to answer #9-11: $f(x) = -\dfrac{3}{4}x + 4$

_____9. This function is: a) Linear b) Exponential c) Quadratic d) Neither

_____10. The initial value is: a) - ¾ b) +4 c) ¾ d) -4

_____11. The graph is: a) Vertical line b) Horizontal line c) Increasing d) Decreasing

_____12. Which of the following functions is NOT linear, quadratic, or exponential?

　　　　a) $f(x) = -2$　　b) $g(x) = 3 - x^2$　　c) $h(x) = x^2 - x^3$　　d) $j(x) = 3^x$

_____13. The graph of the function $y = 2400\left(\dfrac{1}{2}\right)^x$ is:

　　　　a) increasing　　　b) decreasing　　　c) linear　　　d) a parabola

_____14. The table below shows a function that is:

x	y
0	-212
3	-106
6	-53
9	-26.5

a) Linear　　b) Exponential　　c) Quadratic　　d) None of these

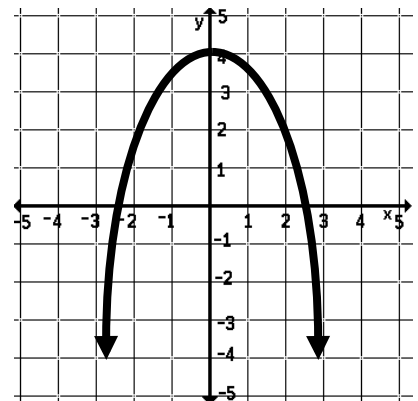_____15. In the table above, the initial value is a) 0　　b) -26.5　　c) 9　　d) -212

Multiple Choice: Use the graph to answer the following:

_____16. The domain is: $a)$ $(-4, 4)$　　$b)$ $x \le 4$　$c)$ $(-\infty, \infty)$　$d)$ $x \ge 4$

_____17. The range is: $a)$ $(-4, 4)$　　$b)$ $y \le 4$　$c)$ $(-\infty, \infty)$　$d)$ $y \ge 4$

_____18. $As\ x \to -\infty,\ y \to$　　$a) -4$　　$b) \infty$　　$c) -\infty$　　$d) -3$

_____19. $As\ x \to \infty,\ y \to$　　$a) -4$　　$b) \infty$　　$c) -\infty$　　$d) -3$

20. Given the function $y = \dfrac{1}{2}x - 4$

a) Graph the function   (2pts)

b) Circle one: Increasing   Decreasing   (1pt)

c) x- intercept (2pts): _____

d) y-intercept (2pts): _____

e) Describe the end behavior (2 @ 1 pt each)

$As\ x \to -\infty,\ y \to$ _____

$As\ x \to \infty,\ y \to$ _____
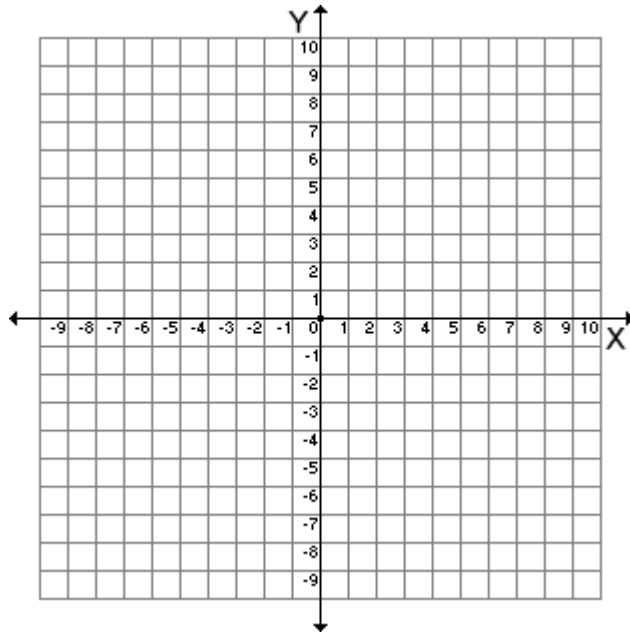
21. A field contains 150 grasshoppers. A population biologist estimates the population will double every week. Write an equation to represent this situation where y= the amount of crickets and x=weeks

22. Using the graph on the right, find the average rate of change for the following interval Show your work!!

Interval: Between x= 1 and x= 6

$Given\ (x_1, y_1)\ and\ (x_2, y_1)$

$Avg.\ rate\ of\ change = \dfrac{y_2 - y_1}{x_2 - x_1}$
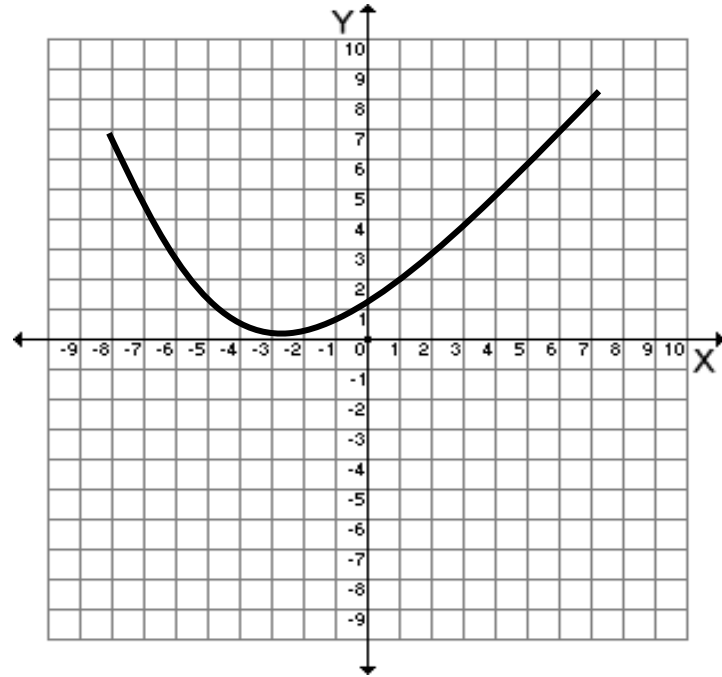
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Arithmetic and Geometric Sequences

Part A: Given the following formula, find the first 4 terms.

1. $a_n = a_{n-1} + 6$, where $a_1 = 0$

2. $a_n = -4a_{n-1}$, where $a_1 = 8$

3. $a_n = 10 - 2(n-1)$

4. $a_n = 100(2)^{n-1}$

5. $a_n = 6 - 10(n-1)$

Part B: Complete the table. Show your work on the bottom or back of the paper.

Sequence	Arithmetic or Geometric?	Common Difference/ Ratio	Recursive Formula	Explicit Formula	Find the given a_n
-4, -6, -8, -10 …					$a_9 =$
84, 71, 58, 45…					$a_{20} =$
64, 16, 4, …					$a_{10} =$
-1, -2, -4, -8, …					$a_7 =$

Arithmetic	
Recursive	Explicit
$a_n = a_{n-1} + d$	$a_n = a_1 + d(n-1)$

Geometric	
Recursive	Explicit
$a_n = a_{n-1} \cdot r$	$a_n = a_1 r^{n-1}$
$(a_n = ra_{n-1})$	

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Domain, Range, Increasing, and Decreasing Intervals

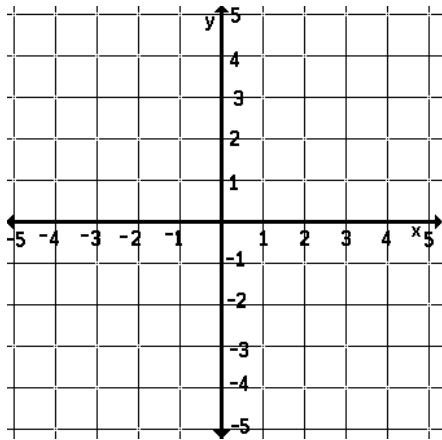**Directions**: Fill in the information describing the graph of each function.
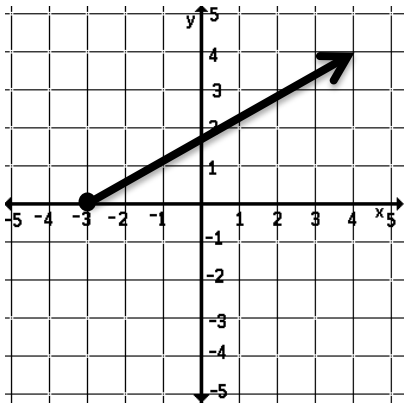
1) Domain:_____
  Range:_____
  Increasing:_____
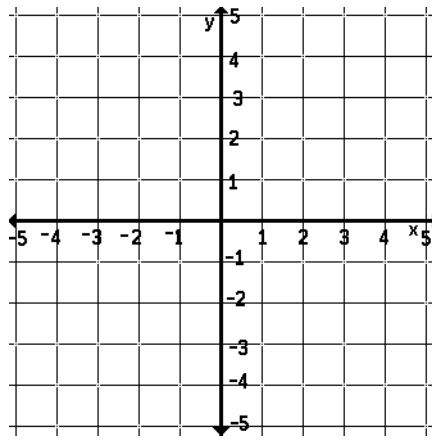**Decreasing:**_____
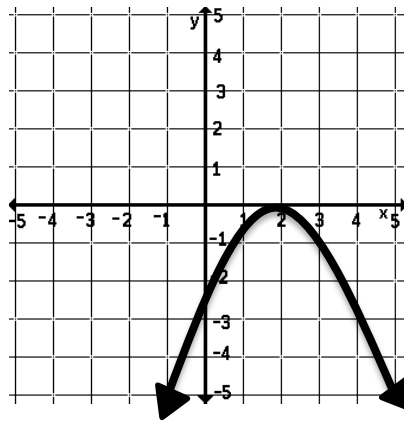
2) Domain:_____
  Range:_____
  Increasing:_____
  Decreasing:_____

For each, sketch a graph that fits the description below (2 @ 5 pts each)

7) Domain: $(-\infty, \infty)$

  Range: $(-\infty, 2]$

Increasing intervals: $(-\infty, -2]$

Decreasing interval: $[-2, \infty)$
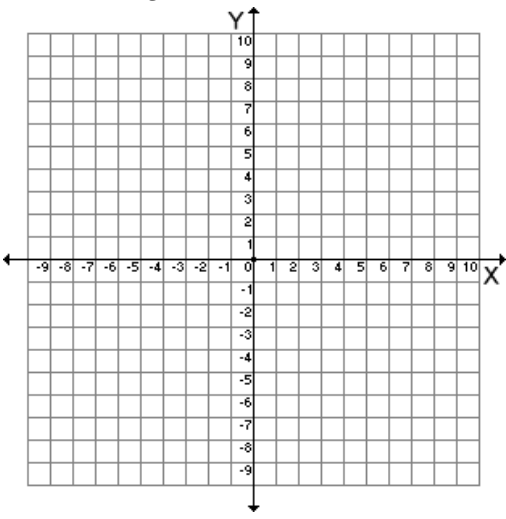
8) Domain: $(0, 3]$

  Range: $(-5, 0]$

Increasing interval: $(0, 3]$
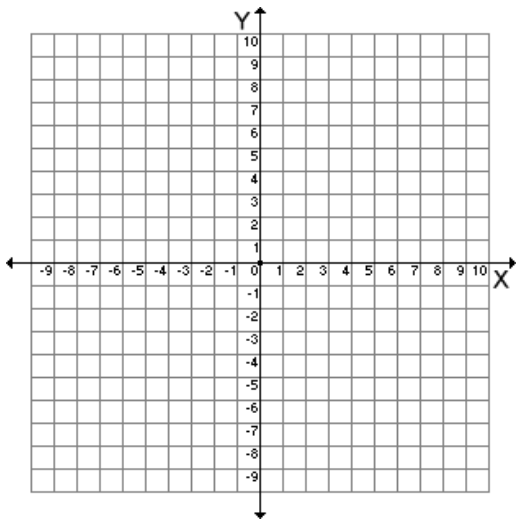
Decreasing interval: None

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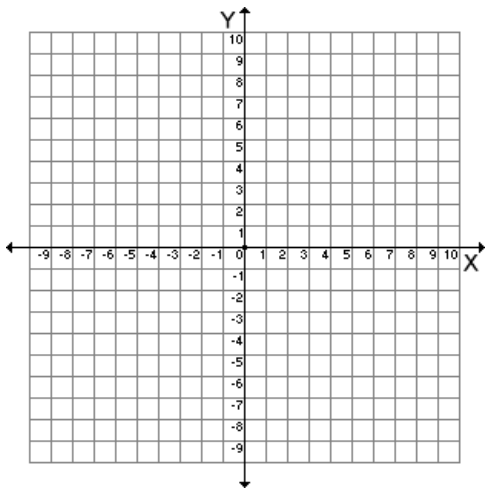
Graphing Functions

1) $y = -\dfrac{2}{3}x + 5$

2) $3x - y = -9$

3) $y = -3$

4) $x = 6$
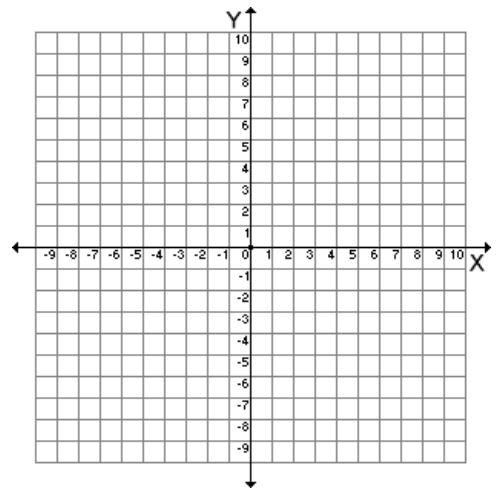
Word Problems

1) Raymond wants to buy tea and coffee K-cups for the staff breakfast. Tea K-cups cost $0.50 each and coffee K-cups cost $1 each. He has $65 to spend on tea and coffee.

Let x=_____ and y=_____

Write an equation to represent the situation._____

If Raymond buys 50 coffee K-cups, what is the greatest number of tea K-cups he can buy?
[Show your work and write a sentence answer]

2) Christa is moving her collection of china pieces by hand to her new house. She has already moved 16 pieces of china and she moves 8 pieces of china each trip.
Let x=_____ and y=_____

Write an equation to represent the situation._____

How many trips will it take Christa to move all of her 216 pieces of china?
[Show your work and write a sentence answer]

3) Grant is buying candles and vases for centerpieces at the meeting hall where he works. Each candle costs $6 and each vase costs $4. He has $200 to spend on them together.

Let x=_____ and y=_____

Write an equation to represent the situation _____

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Linear Regression Mini-Quiz

If necessary (and it makes sense in the context of the problem), round all answers to the nearest hundredth.

Scenario 1: The results of an elementary reading test are posted in the table and compared with the class size.

1. Use your calculator to find the scatter plot using Zoom Stat (9) and sketch it
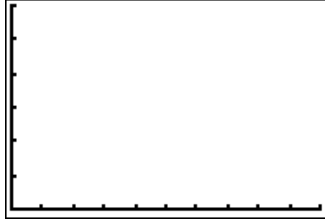
Class size (# of students)	Avg. score on Rdg Test (%)
15	91.1
18	89.2
19	89
19	88.7
22	85.0
23	84.9
24	83.3
26	81.8

2. Describe the correlation based on your scatterplot

3. Find the linear regression line of best fit. Write its equation:_____

4. What is the correlation coefficient? _____ Does the correlation coefficient match with your answer to question 2? Why or why not?

5. What is the slope of the line of best fit? _____ What does this slope represent in terms of the problem situation?

6. What is the *y*-intercept of the line of best fit? _____ What does this *y*-intercept represent in terms of the problem situation?

Bonus: How does this show that the linear regression model is not completely accurate?

7. Use the equation and <u>show your work</u> to predict the average test score if there are 30 students in the class.

8. Use the equation and <u>show your work</u> to predict the class size given an average test score of 80%.

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Scenario 2: The amount of food thrown away yearly per person in America since 2008.
1. Use your calculator to find the scatter plot using Zoom Stat (9) and sketch it (2pts)
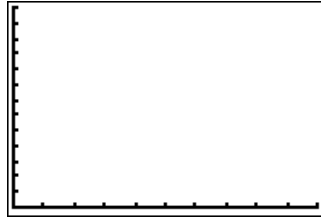
Years since 2008	Pounds of food thrown away per person
1	15.6
2	16.5
3	17.1
4	18.3
5	19.8
6	20.9

2. Describe the correlation based on your scatterplot (1pt)

3. Find the linear regression line of best fit. Write its equation:_____

4. What is the correlation coefficient? _____ Does the correlation coefficient match with your answer to question 2? Why or why not?

5. What is the slope of the line of best fit? _____ What does this slope represent in terms of the problem situation?

6. What is the *y*-intercept of the line of best fit? _____ What does this *y*-intercept represent in terms of the problem situation?

7. Use the equation and <u>show your work</u> to predict the amount of food that will be thrown away by the end of 2017.

8. Use the equation and <u>show your work</u> to predict the number of years since 2008 when the average amount of food thrown away per person is 30 pounds.