Unit 5 Independent Study Project: Comparing & Contrasting Functions

Linear ***Quadratic*** ***Exponential***

You will complete a Learning Packet over Unit 5. You will be able to complete the assignments from Unit 5 Independently and at your own pace. This will allow you to take interest in the concepts at your desired level and research more about comparing/contrasting the three (3) functions we have previously learned (with your interest at the center of learning). In this packet, you fill find a calendar of days you will work independently in class. It will provide a guide of when to complete assignments to stay on track by the due date. It will have homework assignments, a checklist, and Test Review. It is your job to be aware of the calendar so you are prepared daily for class. This is an in-class project. Bring your materials (packet) to class daily. You may use your notes, CW/HW handouts, textbook, workbook, helpful Internet sites and, of course, the teacher, to help you to complete the packet.

OVERVIEW

In this unit students will:

- Deepen their understanding of linear, quadratic, and exponential functions as they compare and contrast the three types of functions.
- Understand the parameters of each type of function in contextual situations.
- Interpret linear, quadratic, and exponential functions that arise in applications in terms of the context.
- Analyze linear, quadratic, and exponential functions and model how different representations may be used based on the situation presented.
- Construct and compare characteristics of linear, quadratic, and exponential models and solve problems.
- Distinguish between linear, quadratic, and exponential functions graphically, using tables, and in context.
- Recognize that exponential and quadratic functions have a variable rate of change while linear functions have a constant rate of change.
- Distinguish between additive and multiplicative change and construct and interpret arithmetic sequences as linear functions and geometric sequences as exponential functions.
- Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
2/12	**2/13**	**2/14**	**2/15**	**2/16**
Quadratic Unit Test	Begin project: -Fun with Functions -Warm-up Matching Activity	-Section 5-2 (teacher led) -Section 5-1 (see notes) -Complete the tables	-Section 5-3 -Section 5-5	-Section 5-4 -Transformations
2/19	**2/20**	**2/21**	**2/22**	**2/23**
<u>WINTER BREAK:</u> YOU SHOULD BE COMPLETING YOUR PACKET DURING THIS TIME!!!				
2/26	**2/27**	**2/28**	**3/1**	**3/2**
-Quiz -Even, odd, neither (see notes)	-Work on paper -Community Service Task	-Work on paper -Unit 5 Study Guide (partial)	-Work on paper -IXL practice	-Review for test **-Independent Study DUE** (all parts)
3/5	**3/6**	**3/7**	**3/8**	**3/9**
Review activity	**Unit Test**	Prepare for Unit 6 presentations	Prepare for Unit 6 presentations	Prepare for Unit 6 presentations

Dates are subject to change.

<u>Early Finishers</u>: IXL (Algebra 1 – Lesson BB or CC) or Edgenuity ONLY

RUBRIC: *The grades will go in as a **cumulative** grade for *each* category.*

Fun with Functions	20 points	HW
Section 5-1	40 points	CW
Section 5-2	20 points	HW
Section 5-3	40 points	CW
Section 5-4	40 points	CW
Section 5-5	55 points	CW
Warm-up: Matching Activity	25 points	CW
Complete the tables	50 points	CW
Transformations	12 points	CW
Even/Odd/Neither	15 points	HW
Community Service Task	100 points	Project
Two-paged Paper (see below)	100 points	Project
Unit 5 Study Guide (partial)	30 points	HW

Summarize your findings of this project by writing a **two-page typed paper** comparing and contrasting the three types of functions. Be sure to include the similarities and differences of each of the functions discussed. Use the findings of this assignment to help guide your thinking. The essential questions below may also be used as a guide to help you. Be sure your paper is thorough, double-spaced, 12-point Times New Roman font.

ESSENTIAL QUESTIONS

- Why is the concept of a function important and how do I use function notation to show a variety of situations modeled by functions?
- How do I interpret functions that arise in applications in terms of context?
- How do I use different representations to analyze linear and exponential functions?
- How do I build a linear or exponential function that models a relationship between two quantities?
- How do I build new functions from existing functions?
- How can we use real-world situations to construct and compare linear and exponential models and solve problems?
- How is a relation determined to be linear, quadratic, or exponential?
- What are the specific features that distinguish the graphs of linear, quadratic, and exponential functions from one another?

If you used the Internet as a resource, please include a "Sites Used" page, which includes the web address or texts used (see ELA teacher for MLA format).

Fun with Functions:

Directions: Cut out each box on this paper. Look carefully at the mixed up boxes below and decide in which column & row they belong on the grid provided. Each needs to be classified as a linear, quadratic, absolute value, or exponential function.

Definition: A function that is graphed as a partially curved line that portrays VERY fast increase or decrease of one variable. (Growth or decay)

Definition: A function that is graphed as a straight line and has a constant rate of change (positive or negative).

Definition: A function that is graphed as a v - shape and shows only positive values for y. (Linear pattern until it reaches the vertex, then the pattern reverses in the other direction.)

Definition: A function that is graphed as a parabola (or u-shape) and shows increase and decrease of one variable.

X	Y
4	21
2	9
0	5
-2	9
-4	21

X	Y
5	33
6	30
7	27
8	24
9	21

X	Y
0	¼
1	1
2	4
3	16
4	64

X	Y
-3	0
-2	1
-1	2
0	1
1	0

Jasmine's mother tells her she can travel 3 miles from her house in either direction; East or West.

Each year Gertrude counts her tulips in her garden. Over the past few years, she has noticed a definite pattern in that the number of tulips triples each year.

Coach Cowell kicks a soccer ball in the air during gym class. He has the students measure the height of the ball from start to finish at 5 different times during the flight.

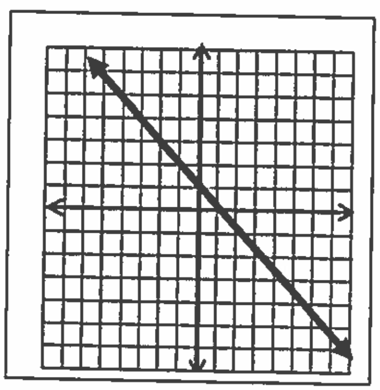
Jon currently has $45 in his wallet. He earns 2 dollars for every newspaper he sells on his route.

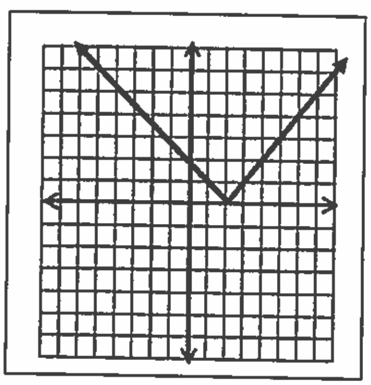
$y = 5(3)^x$

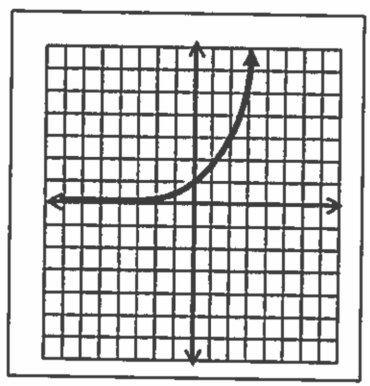
$y = 6x^2 + 11x - 35$

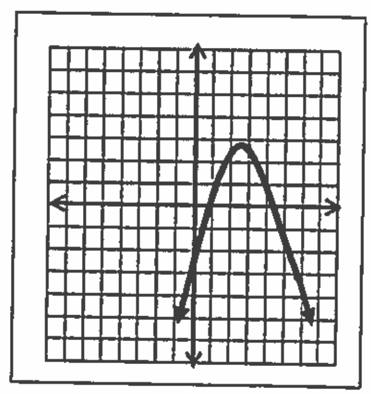
$y = -|x + 1| + 2$

$y = -\frac{2}{3}x + 7$









Fun with Functions!

Name: ______________________________ Hour: ________

	Linear Functions	Exponential Functions	Absolute-Value Functions	Quadratic Functions
Definition				
Equation				
Real-World Situation				
Table				
Graph				

Warmup: Matching Activity

Below are three graphs, three tables, and three functions. Identify the table and graph that represents each of the three functions.

A) $f(x) = 2x + 3$

B) $f(x) = 2x^2 + 3$

C) $f(x) = 2^x + 3$

1)

x	f(x)
-2	$\frac{13}{4}$
-1	$\frac{7}{2}$
0	4
1	5
2	7

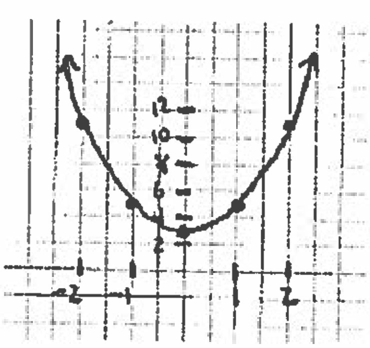
2)

x	f(x)
-2	-1
-1	1
0	3
1	5
2	7

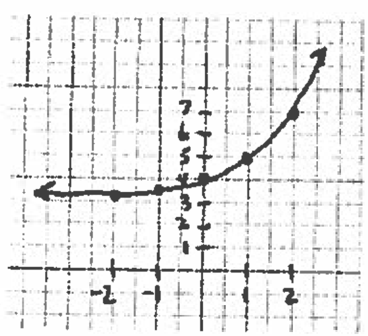
3)

x	f(x)
-2	11
-1	5
0	3
1	5
2	11

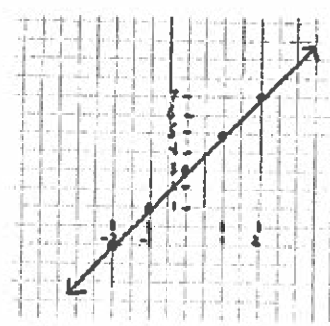
a)



b)



c)



Attribute	Linear Functions	Quadratic Functions	Exponential Functions
Rate of change			
Domain & Range			
Intercepts			
Asymptotes			
End Behavior			

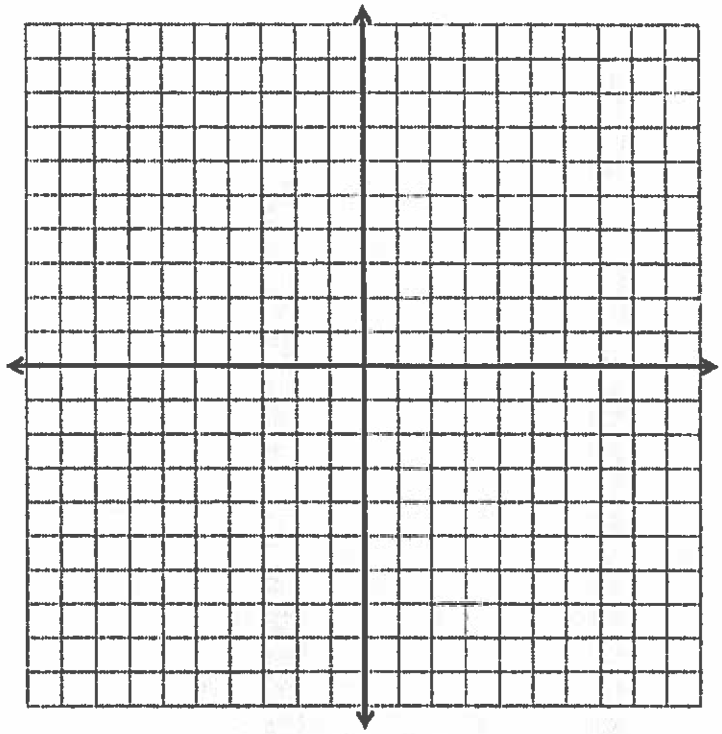
Functions to Graph and Discuss:

$f(x) = 2x + 3$ $f(x) = 2x^2 + 3$ $f(x) = 2^x + 3$

1. Complete the tables below.

Linear		Quadratic		Exponential	
$f(x) = 2x$		$g(x) = x^2$		$h(x) = 2^x$	
x	$f(x)$	x	$g(x)$	x	$h(x)$
–5		–5		–5	
–4		–4		–4	
–3		–3		–3	
–2		–2		–2	
–1		–1		–1	
0		0		0	
1		1		1	
2		2		2	
3		3		3	
4		4		4	
5		5		5	

2. Draw and label each graph on the same set of axes.



3. Identify the following features of each function.

(a) Domain and Range

(b) Description of Shape

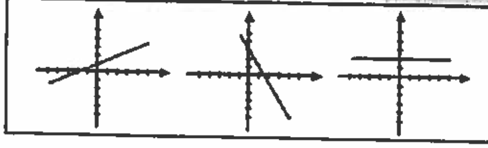
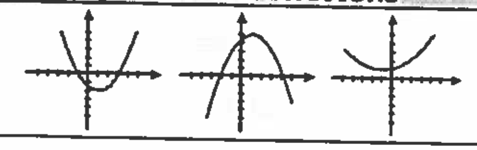
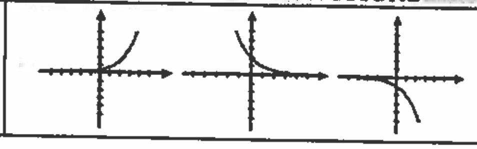
(c) Any characteristics unique to each function

	Linear	Quadratic	Exponential
Domain Range			
Description of Shape			
Unique Characteristics To each function			

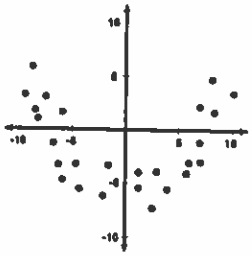
Sec 5.1 – Identifying the Function
Linear, Quadratic, or Exponential Functions

Name: ____________

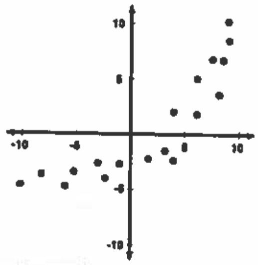
GRAPHICAL EXAMPLES

LINEAR FUNCTIONS	QUADRATIC FUNCTIONS	EXPONENTIAL FUNCTIONS
		

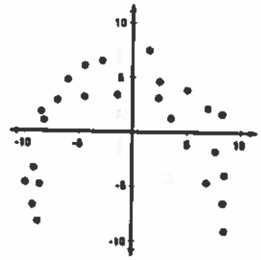
1. Graphically identify which type of function model might best represent each scatter plot.



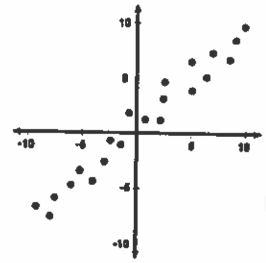
Model (circle one): Linear Quadratic Exponential



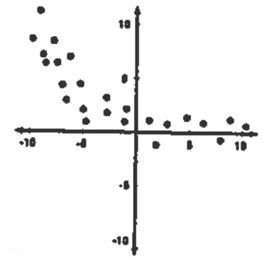
Model (circle one): Linear Quadratic Exponential



Model (circle one): Linear Quadratic Exponential



Model (circle one): Linear Quadratic Exponential



Model (circle one): Linear Quadratic Exponential

2. Match each graph with its description.

____ I. An **exponential** function that is always **increasing.**

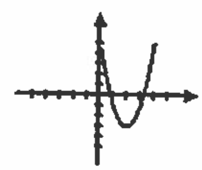
____ II. An **exponential** function that is always **decreasing.**

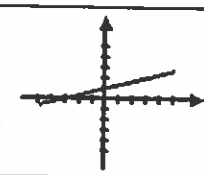
____ III. A **quadratic** function with a **local maximum.**

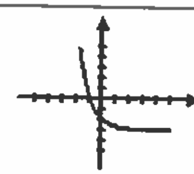
____ IV. A **quadratic** function with a **local minimum.**

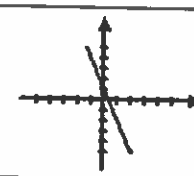
____ V. A **linear** function that is always **increasing.**

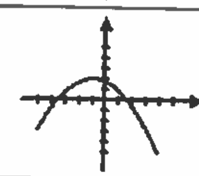
____ VI. A **linear** function that is always **decreasing.**

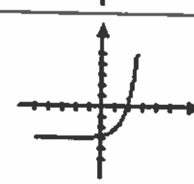
a.


b.


c.


d.


e.


f.


3. Which is the only type of function below that has an asymptote when graphed?

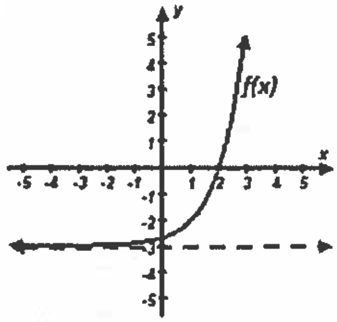
A. Linear Function B. Quadratic Function C. Exponential Function

4. Which is the only type of function below that could have a local maximum?

A. Linear Function B. Quadratic Function C. Exponential Function

5. Describe the end behavior of each of the function below.

A.

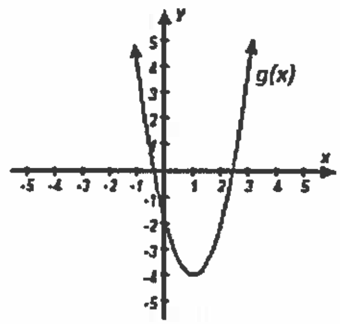


Name:__________________

As $x \to -\infty$, $f(x) \to$__________

As $x \to \infty$, $f(x) \to$__________

B.

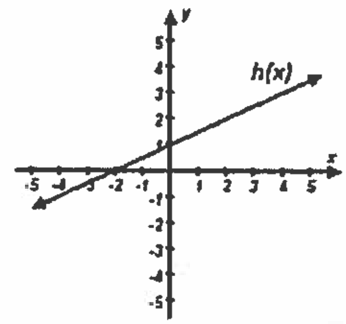


Name:__________________

As $x \to -\infty$, $g(x) \to$__________

As $x \to \infty$, $g(x) \to$__________

C.



Name:__________________

As $x \to -\infty$, $h(x) \to$__________

As $x \to \infty$, $h(x) \to$__________

6. Which is the only function that might have end behavior such that as x approaches infinity, $f(x)$ approaches 4?

A. Linear Function B. Quadratic Function C. Exponential Function

7. Which is the only function below that might have end behavior such that:
- As $x \to -\infty$, $f(x) \to \infty$
- As $x \to \infty$, $f(x) \to \infty$

A. Linear Function B. Quadratic Function C. Exponential Function

8. Which is the only function below that might have end behavior such that:
- As $x \to -\infty$, $f(x) \to -\infty$
- As $x \to \infty$, $f(x) \to \infty$

A. Linear Function B. Quadratic Function C. Exponential Function

9. Which is the only function below that might have end behavior such that:
- As $x \to -\infty$, $f(x) \to -\infty$
- As $x \to \infty$, $f(x) \to -\infty$

A. Linear Function B. Quadratic Function C. Exponential Function

10. Based on the function given identify which description best fits the function.

A. $f(x) = x(2x + 3)$

Model (circle one):

Linear Growth	Quadratic (Local Max)	Exponential Growth
Linear Decay	Quadratic (Local Min)	Exponential Decay

B. $g(x) = 3(1 - 2x) - 4$

Model (circle one):

Linear Growth	Quadratic (Local Max)	Exponential Growth
Linear Decay	Quadratic (Local Min)	Exponential Decay

C. $h(x) = 2 + \left(\frac{1}{2}\right)^x$

Model (circle one):

Linear Growth	Quadratic (Local Max)	Exponential Growth
Linear Decay	Quadratic (Local Min)	Exponential Decay

D. $m(x) = 3 \cdot (2)^x + 1$

Model (circle one):

Linear Growth	Quadratic (Local Max)	Exponential Growth
Linear Decay	Quadratic (Local Min)	Exponential Decay

E. $p(x) = 2 - 3x^2 + x$

Model (circle one):

Linear Growth	Quadratic (Local Max)	Exponential Growth
Linear Decay	Quadratic (Local Min)	Exponential Decay

F. $q(x) = \frac{1}{2}x - 1$

Model (circle one):

Linear Growth	Quadratic (Local Max)	Exponential Growth
Linear Decay	Quadratic (Local Min)	Exponential Decay

11. Based on the partial set of values given for a function, identify which description best fits the function.

x	0	1	2	3	4
$a(x)$	1	5	9	13	17

Model (circle one):

Linear Growth	Quadratic (Local Max)	Exponential Growth
Linear Decay	Quadratic (Local Min)	Exponential Decay

x	1	2	3	4	5
$b(x)$	1	2	1	-2	-7

Model (circle one):

Linear Growth	Quadratic (Local Max)	Exponential Growth
Linear Decay	Quadratic (Local Min)	Exponential Decay

x	1	2	3	4	5
$c(x)$	0	2	6	14	30

Model (circle one):

Linear Growth	Quadratic (Local Max)	Exponential Growth
Linear Decay	Quadratic (Local Min)	Exponential Decay

x	0	1	2	3	4
$d(x)$	3	0	-1	0	3

Model (circle one):

Linear Growth	Quadratic (Local Max)	Exponential Growth
Linear Decay	Quadratic (Local Min)	Exponential Decay

x	1	2	3	4	5
$e(x)$	65	33	17	9	5

Model (circle one):

Linear Growth	Quadratic (Local Max)	Exponential Growth
Linear Decay	Quadratic (Local Min)	Exponential Decay

x	1	2	3	4	5
$f(x)$	9	7	5	3	1

Model (circle one):

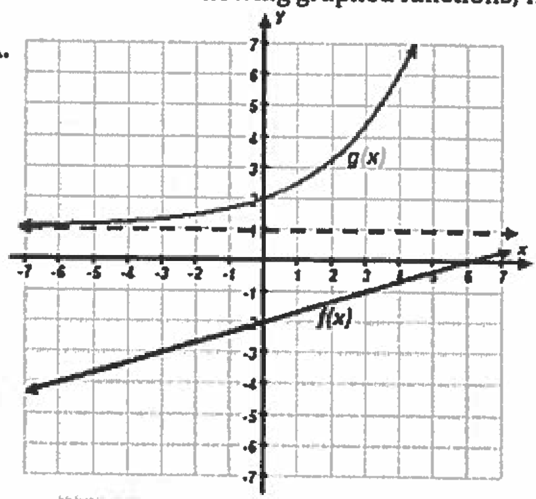
Linear Growth	Quadratic (Local Max)	Exponential Growth
Linear Decay	Quadratic (Local Min)	Exponential Decay

Sec 5.2 – Function Inequalities Comparing Linear, Quadratic, or Exponential Functions

Name: ____________

1. Consider the following graphed functions; fill in the blank comparing the functions with an inequality symbol.

A.

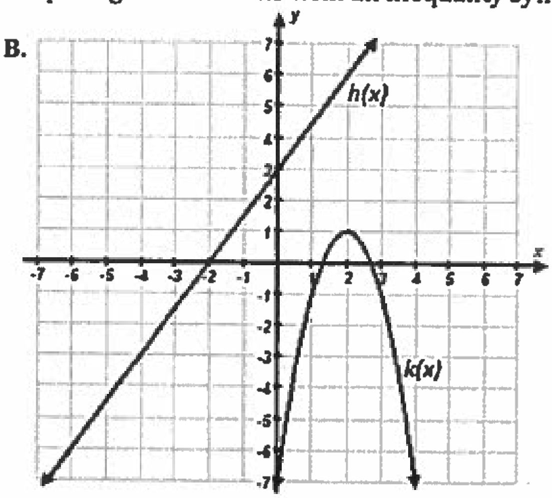


For all values of x,

$f(x)$ _____ $g(x)$

Determine the appropriate inequality symbol (< or >) to put between the two functions.

B.



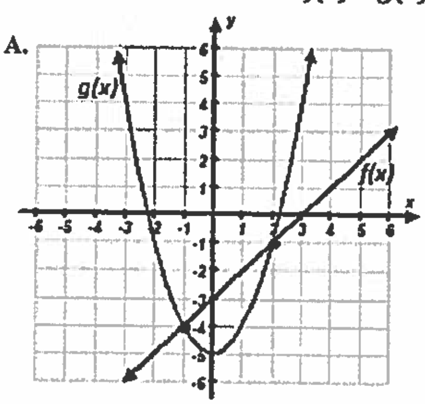
For all values of x,

$h(x)$ _____ $k(x)$

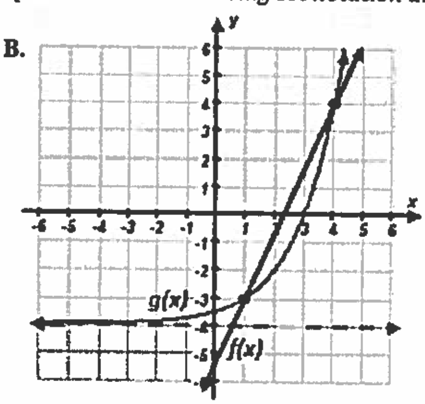
Determine the appropriate inequality symbol (< or >) to put between the two functions.

2. For which values of x is $f(x) > g(x)$? *(Write the interval using set notation and interval notation.)*

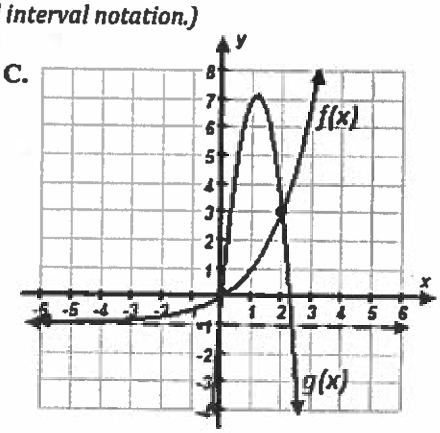
A.



B.



C.



3. Write an inequality statement for all x of which function is greater.

A. $f(x) = -x^2 - 3$
$g(x) = \frac{1}{2}x + 2$

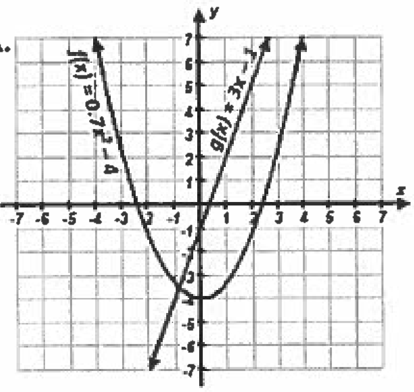
$f(x)$ _____ $g(x)$

B. $p(x) = 3^x + 2$
$q(x) = \frac{1}{2}x - 2$

$p(x)$ _____ $q(x)$

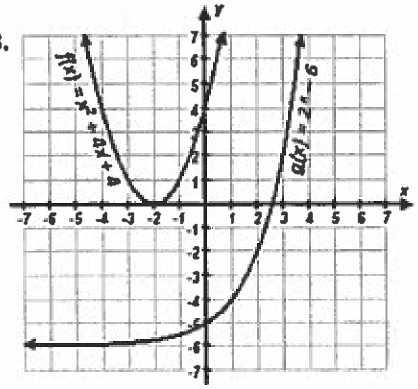
4. Consider the following functions.

A.



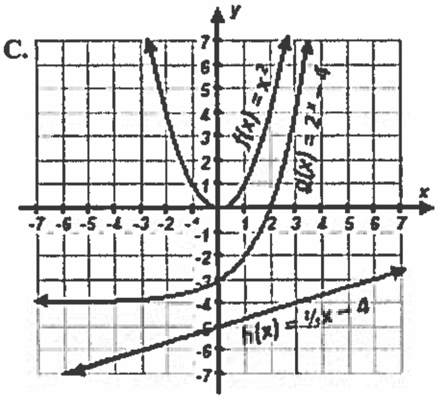
As $x \to \infty$, which function becomes the largest?

B.



As $x \to \infty$, which function becomes the largest?

C.



As $x \to \infty$, which function becomes the largest?

5. A partial set of values is provided for two functions in each problem below. For all $x \geq 0$, which function would most likely be greater. If the greater function changes determine the appropriate intervals.

A.

x	0	1	2	3	4	5
$m(x)$	1	2	3	4	5	6

x	0	1	2	3	4	5
$w(x)$	2	3	6	11	18	27

B.

x	0	1	2	3	4	5
$f(x)$	−2	−1	1	5	13	29

x	0	1	2	3	4	5
$p(x)$	−3	−2	1	6	13	22

C.

x	0	1	2	3	4	5
$g(x)$	5	9	13	17	21	25

x	0	1	2	3	4	5
$h(x)$	0	1	4	9	16	25

D.

x	0	1	2	3	4	5
$q(x)$	0	1	3	7	15	34

x	0	1	2	3	4	5
$t(x)$	−1	0	3	8	15	24

6. Consider the function and given the transformation determine which statements are true and which are false.

a. $p(x) < h(x) + 3$ for all values of x.

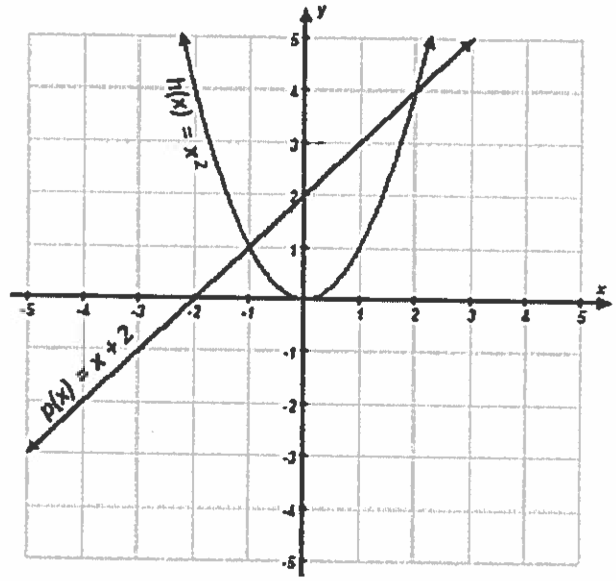
Model (circle one):
TRUE FALSE

b. $p(x) < h(x - 3)$ for all values of x.

Model (circle one):
TRUE FALSE

c. $p(x - 4) < h(x)$ for all values of x.

Model (circle one):
TRUE FALSE



d. $-f(x) < g(x)$ for all values of x.

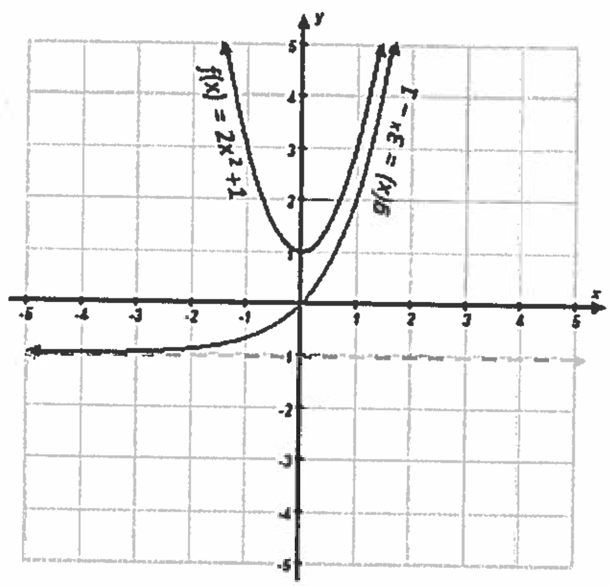
Model (circle one):
TRUE FALSE

e. $f(-x) < g(x)$ for all values of x.

Model (circle one):
TRUE FALSE

f. $f(x) > -g(x)$ for all values of x.

Model (circle one):
TRUE FALSE



Sec 5.3 – Average Rate of Change Comparison Linear, Quadratic, or Exponential Functions

Name:

1. Find the average rate of change from $x = -1$ to $x = 2$ for each of the functions below.

a. $a(x) = 2x + 3$

b. $b(x) = x^2 - 1$

c. $c(x) = 2^x + 1$

d. Which function has the greatest average rate of change over the interval [– 1, 2]?

2. Find the average rate of change on the interval [2, 5] for each of the functions below.

a. $a(x) = 2x + 1$

b. $b(x) = x^2 + 2$

c. $c(x) = 2^x - 1$

d. Which function has the greatest average rate of change over the interval $x = 2$ to $x = 5$?

3. In general as $x \to \infty$, which function eventually grows at the fastest rate?

a. $a(x) = 2x$

b. $b(x) = x^2$

c. $c(x) = 2^x$

4. Find the average rate of change from $x = -1$ to $x = 2$ for each of the continuous functions below based on the partial set of values provided.

a.

x	−1	0	1	2	3
$a(x)$	−3	−2	1	6	13

b.

x	−1	0	1	2	3
$b(x)$	1	3	5	7	9

c.

x	−1	0	1	2	3
$c(x)$	−2	−1	1	5	13

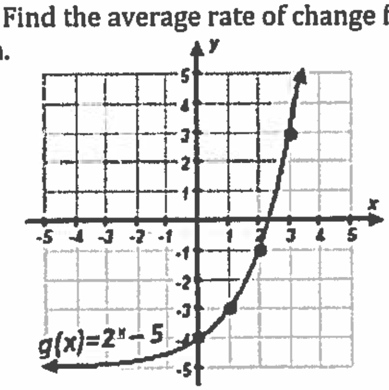
d. Which function has the greatest average rate of change over the interval [− 1, 2]?

5. Consider the table below that shows a partial set of values of two continuous functions. Based on any interval of x provided in the table which function always has a larger average rate of change?

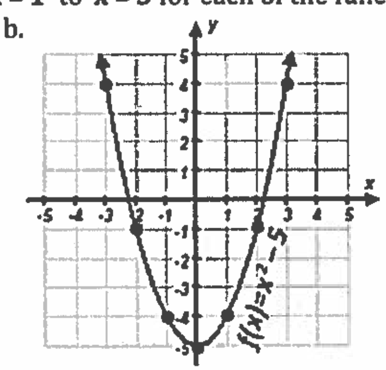
x	$f(x)$	$g(x)$
−1	−2	−4
0	0	0
1	3	8
2	7	24

6. Find the average rate of change from $x = 1$ to $x = 3$ for each of the functions graphed below.

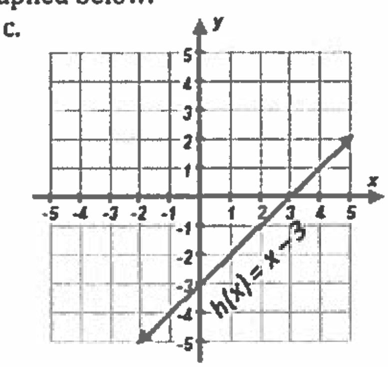
a.



b.



c.



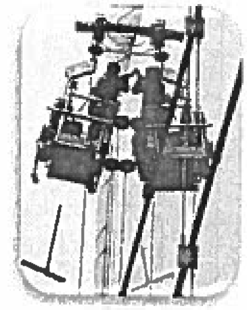
d. Find an interval of x over which all three graphed functions above have the same average rate of change.

MATH Georgia Standards Of Excellence

Sec 5.4 – Contextual Model Comparison
Linear, Quadratic, or Exponential Functions

Name:

1. Which of the following would be best modeled by a LINEAR, QUADRATIC, or EXPONENTIAL function.
   a. A window cleaner is cleaning windows about half way up the Peachtree Plaza Hotel in Downtown Atlanta. The cleaner didn't properly clip one of his squeegee tools and it fell from 400 feet up in the air. The height of the squeegee t seconds after it fell is given below. What type of function **(Linear, Quadratic, or Exponential)** would best describe the squeegee's height as a function of time?



Time (seconds)	0	1	2	3	4	5
Squeegee Height (feet)	400	384	336	256	144	0

   b. Joey's shower fixture began leaking water. So, he called a plumber to help him fix the problem. The plumber said he would charge $100 for making a house call and $60 for every hour he is there working on the problem. What type of function **(Linear, Quadratic, or Exponential)** would best describe the amount the plumber charges the customer? Can you write the function?

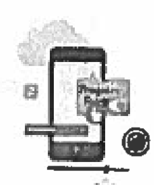
Time (hours)	0	1	2	3	4
Cost (dollars)	100	160	220	280	340

   c. A pot of tea was brewed such that its temperature was 200°F and then the stove was turned off. The pot of tea slowly cooled back to the room temperature of 80°F over a few hours. The data is shown below in the table. What type of function **(Linear, Quadratic, or Exponential)** would best describe the temperature?

Time (hours)	0	1	2	3	4
Temperature (degrees)	200 °F	140 °F	110 °F	95 °F	87.5 °F

2. Which of the following would be best modeled by a LINEAR, QUADRATIC, or EXPONENTIAL function.
   a. A company named 'Fone Faze Foundary' designs the hardware for new smart phones and is offering a new employee an initial salary of $40,000 a year and will get a raise of an additional $6,000 for each year she works for the company. What type of function **(Linear, Quadratic, or Exponential)** would best describe the employee's salary based on the number of years that she works for the company? Can you determine the function?

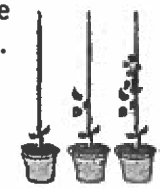
   b. A company named 'Phone Program Ring' designs the software for new smartphones is offering a new employee an initial salary of $40,000 a year and will get a raise of an increase of 12% each year he works for the company. What type of function **(Linear, Quadratic, or Exponential)** would best describe the employee's salary based on the number of years that he works for the company? Can you determine the function?



   c. Which company would provide a better salary after 2 years of employment? After 8 years?

3. Explain what each of the parameter of each model mean.

   a. A student was marking the growth of a corn stalk plant and at least for the first several weeks the plant's height in inches could be described by the following model (where t is the time in weeks).

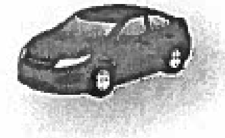


$$h(t) = 5(1.40)^t$$

   i) What does the 5 represent? ii) What does the 1.40 represent?

   b. A person purchased a new car which depreciates in value. The car owner determined the value of the car in dollars could be modeled by the following function (where t is in years after the car was purchased).

$$v(t) = 23000(0.93)^t$$



   i) What does the 23000 represent? ii) What does the 0.93 represent?

   c. A physical therapist charges an initial fee and then charges another amount per hour of therapy. The charges could be described by the following function model (where t is in hours of therapy).

$$c(t) = 140 + 40t$$

   i) What does the 40 represent? ii) What does the 140 represent?

   d. A baseball is struck by a bat. The height in feet of the ball can described by the following function (where t is in seconds after the ball was struck).

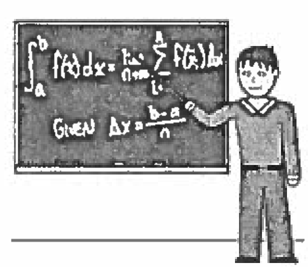
$$h(t) = -16(t - 2.4)^2 + 70$$

   i) What does the 2.4 represent? ii) What does the 70 represent?

4. Create a function model for each of the following:

   a. Some kids are selling lemonade for \$1.50 per cup at a high school baseball game. They spent \$14 on all of the items needed for the lemonade stand (cups, lemonade, table cloth, sign, etc.). Create a function that would represent their profit based on the number of cups of lemonade they sold.

   b. A first year teacher is paid \$38,000. Each year she is paid an additional 5% over the previous year. Create function that would represent the teacher's salary based on the number of years that the teacher worked.



5. Comparing function types

a. A top level professional sports organization offers its athletes two different bonus retirement plans.
Option #1: They will start an account and add $20,000 years for each year the player plays successfully for the organization.

Years Played	0	1	2	....
Retirement Account	$20,000	$40,000	$60,000	....

Option #2: They will start an account with $20,000 the add 50% to the value of the account for each year the athlete successfully plays for the team.

Years Played	0	1	2	....
Retirement Account	$20,000	$30,000	$45,000	....

Which option would be better for the athlete if he played for the team for 3 years? How much of difference is there between the two plans?

Which option would be better for the athlete if he played for the team for 10 years? How much of difference is there between the two plans?

b. Two different computer programmers are trying to hack in to a computer file that has been protected by an encryption key using a brute force method in which a computer begins trying all possible passwords. A company is going to higher the programmer that successfully retrieves the file first.

The first computer programmer, Bill, wrote a brute force program that will try 50 thousands passwords each minute.

Minutes Passed	1	2	3	4	5	.....
Passwords Attempted in a minute (in thousands)	50	50	50	50	50	.....
Total Passwords Attempted (in thousands)	50	100	150	200	250	.....

The second computer programmer, Marcy, wrote an adaptive program that leveraged the hardware more efficiently that will try 5 thousand passwords the first minute, 10 thousand the next minute, 20 thousand the next minute, and continue doubling the attempts each minute.

Minutes Passed	1	2	3	4	5	.....
Passwords Attempted in a minute (in thousands)	5	10	20	40	80	.....
Total Passwords Attempted (in thousands)	5	15	35	75	155	.....

Which programmer will have tried the most passwords to break the code at the end of 5 minutes? How much difference is there between the two programmers?

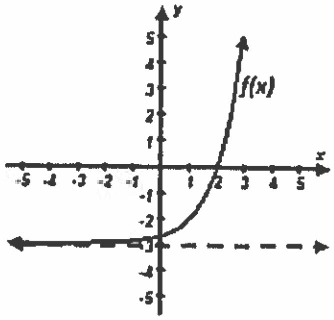
Which programmer will have tried the most passwords to break the code at the end of 10 minutes? How much difference is there between the two programmers?

Georgia Standards Of Excellence

Sec 5.5 – Domain and Range Comparison
Linear, Quadratic, or Exponential Functions Name:

1. Determine the Domain and Range of each of the following graphed functions (using Interval and Set Notations).

A.



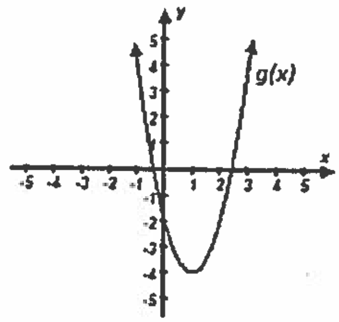
Domain (INTERVAL): ____________

Domain (SET): ____________

Range (INTERVAL): ____________

Range (SET): ____________

B.



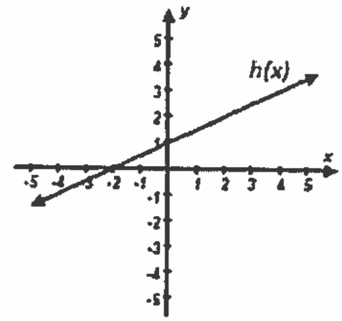
Domain (INTERVAL): ____________

Domain (SET): ____________

Range (INTERVAL): ____________

Range (SET): ____________

C.



Domain (INTERVAL): ____________

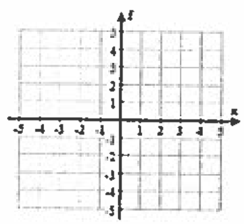
Domain (SET): ____________

Range (INTERVAL): ____________

Range (SET): ____________

2. Determine the Domain and Range of each of the following graphed functions (using Interval and Set Notations).

A. $m(x) = 2(x-1)^2 - 3$



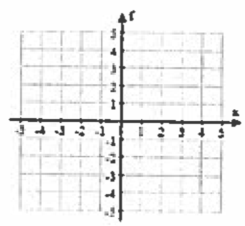
Domain (INTERVAL): ____________

Domain (SET): ____________

Range (INTERVAL): ____________

Range (SET): ____________

B. $p(x) = 2^x + 1$



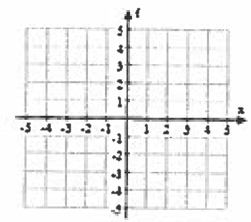
Domain (INTERVAL): ____________

Domain (SET): ____________

Range (INTERVAL): ____________

Range (SET): ____________

C. $q(x) = 2x - 4$



Domain (INTERVAL): ____________

Domain (SET): ____________

Range (INTERVAL): ____________

Range (SET): ____________

3. If we only considered the functions LINEAR, QUADRATIC, and EXPONENTIAL, which is the only one that could have a **range of** $[-\infty, \infty)$?

4. If we only considered the functions LINEAR, QUADRATIC, and EXPONENTIAL, which is the only one that could have a **range of** $(2, \infty)$?

5. If we only considered the functions LINEAR, QUADRATIC, and EXPONENTIAL, which is the only one that could have a **range of** $[-5, \infty)$?

1. How would the graph of the function $y = x^2 - 8$ be affected if the function were changed to $y = x^2 - 3$?

a. The graph would shift 5 units to the left.
b. The graph would shift 5 units down.
c. The graph would shift 5 units up.
d. The graph would shift 3 units down.

2. How would you translate the graph of $y = -|2x|$ to produce the graph of $y = -|2x| - 4$

a. translate the graph of $y = -|2x|$ down 4 units
b. translate the graph of $y = -|2x|$ up 4 units
c. translate the graph of $y = -|2x|$ left 4 units
d. translate the graph or $y = -|2x|$ right 4 units

3. Compare the graph of $g(x) = x^2 + 6$ with the graph of $f(x) = x^2$.

a. The graph of g(x) is wider.
b. The graph of g(x) is narrower.
c. The graph of g(x) is translated 6 units down from the graph of f(x).
d. The graph of g(x) is translated 6 units up from the graph of f(x).

4. Compared to the graph of $f(x) = 2^x$, the graph of $g(x) = 2(2^x) - 5$ is ______.

a. stretched and translated down
b. stretched and translated up
c. shrunk and translated down
d. shrunk and translated up

5. Four bowls with the same height are constructed using quadratic equations as their shapes. Which bowl has the narrowest opening?

a. Bowl 1: $\frac{1}{8}x^2$
b. Bowl 2: $\frac{1}{4}x^2$
c. Bowl 3: $5x^2$
d. Bowl 4: $7x^2$

6. The points {(−3, 2), (0, 1), (4, 5)} are on the graph of function *f*. What are the coordinates of these three points after a horizontal stretch by a factor of 3, followed by a reflection across the *x*-axis?

a. {(−9, −2), (0,-1), (12, −5)}
b. $\left\{(-1,-2),(0,-1),\left(\frac{4}{3},-5\right)\right\}$
c. {(−9, 2), (0, 1), (12, 5)}
d. {(−3, −6), (0, −3), (4, −15)}

Use this description to write the quadratic function in vertex form:

7. The parent function $f(x)=|x|$ is vertically stretched by a factor of 2 and translated 14 units right and 6 units up.

a. $g(x)=\frac{1}{2}|x-14|+6$
b. $g(x)=2|x-14|+6$
c. $g(x)=2|x-14|-6$
d. $g(x)=2|x+14|+6$

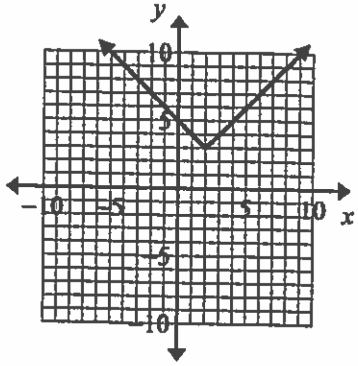
8. Which function is NOT a translation of $f(x) = x^2 + 17$?
a. $f(x) = (x-4)^2 + 17$
b. $f(x) = x^2 - 4$
c. $f(x) = -x^2 - 17$
d. $f(x) = \left(x+\frac{1}{2}\right)^2$

9. Which function's graph is the widest parabola?
a. $y = \frac{1}{8}x^2$
b. $y = \frac{1}{3}x^2$
c. $y = 3x^2$
d. $y = 8x^2$

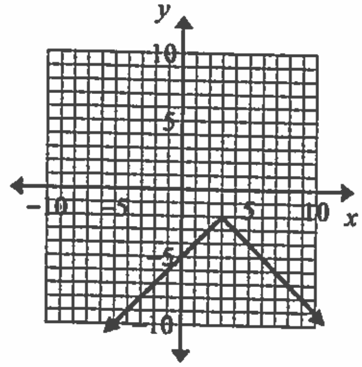
10. Which transformation from the graph of a function $f(x)$ describes the graph of $10f(x)$?
a. horizontal shift left 10 units
b. vertical shift up 10 units
c. vertical stretch by a factor of 10
d. vertical shift down 10 units

11. Which graph represents the equation $y = -|x-2|+3$?

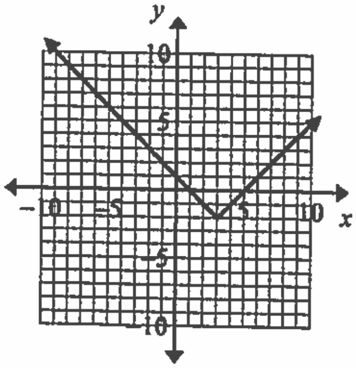
A.



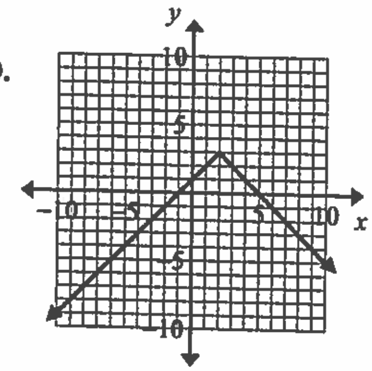
C.



B.



D.



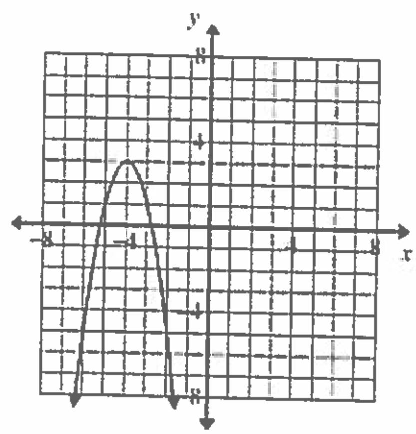
12. Which equation represents the graph?

A. $y = 2(x+4)^2 + 3$

B. $y = 2(x-4)^2 - 3$

C. $y = -2(x+4)^2 + 3$

D. $y = -2(x-4)^2 - 3$

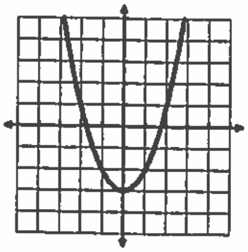


Coordinate Algebra Homework Day 126

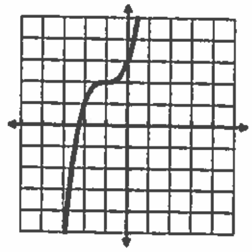
Name: ______________________ Date: ______________

Tell whether the function is even, odd, or neither.

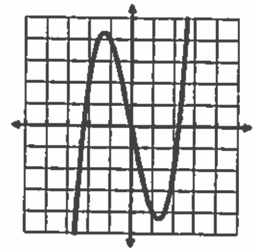
1.



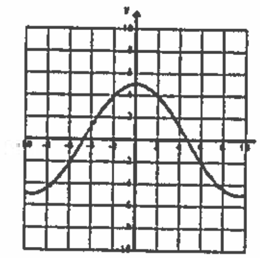
2.



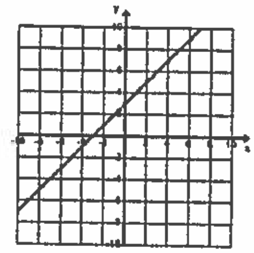
3.



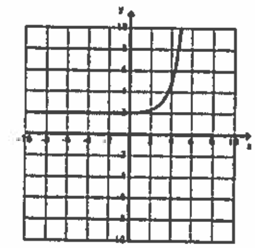
4.



5.



6.



7. $f(x)=x^3-x^2$

8. $f(x)=-x^3+2x$

9. $f(x)=x^3+4x+1$

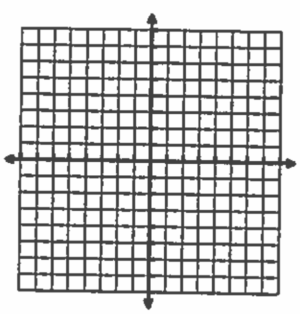
10. $f(x)=\frac{1}{2}x^4+9$

11. $f(x)=5x+1$

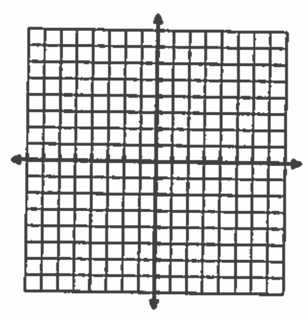
12. $f(x)=5$

Think about:

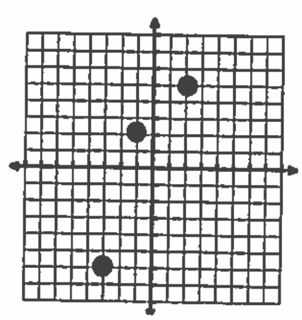
13. Can a linear function ever be even or odd? If so, sketch an example.



14. Can an exponential function ever be even or odd? If so, sketch an example.



15. If the following points are on an **odd** function, what other points are on the function? Give the coordinates.



Name: ______________________________ Date: ____________________

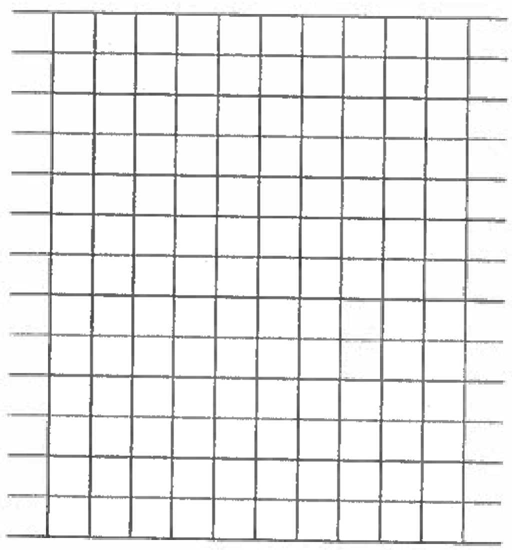
Community Service, Sequences, and Functions Task

Larry, Moe, and Curly spend their free time doing community service projects. They would like to get more people involved. They began by observing the number of people who show up to the town cleanup activities each day. The data from their observations is recorded in the table below for the Great Seven Day Cleanup.

X	Y
1	5
2	27
3	49
4	71

1. Give a verbal description of what the domain and range presented in the table represents.

2. Sketch the data on the grid below. Should the dots be connected?



3. Determine the type of function modeled in the graph above and describe key features of the graph.

4. Using the same data gathered during the Great Four Day Cleanup, write an explicit formula using function notation.

5. How would Larry, Curly, and Moe use the explicit formula to predict the number of people who would help if the cleanup campaign went on for 7 days and was renamed the Great Seven Day Cleanup?

Excited about the growing number of people participating in community service, Larry, Curly, and Moe decide to have a fundraiser to plant flowers and trees in the parks that were cleaned during the Great Four Day cleanup. It will cost them $5,000 to plant the trees and flowers. They decided to sell some of the delicious pies that Moe bakes with his sisters. For every 100 pies sold, it costs Moe and his sisters $20.00 for supplies and ingredients to bake the pies. They decided to sell the pies for $5.00 each.

7. Complete the following table to find the total number of pies sold and the amount of money the trio collects for their next community service project. Assume there was a total of 10 customers on Day 1.

a. On the first day of selling pies, each customer buys the same number of pies as his customer number. Complete the table.

Customer Number	Number of Pies Sold	Cost of Pie(s)
1	1	5
2	2	10
3	3	15
4		
5		
6		
7		
8		
9		
10		
Total		

b. Write a recursive and explicit formula for the pies sold on day one, as well as the cost of the pies each day.

c. On the second day of selling pies the first customer buys 1 pie, the second customer buys 2 pies, the third customer buys 4 pies, the fourth customer buys 8 pies, and so on. Complete the table based on the pattern established.

Customer Number	Number of Pies Sold	Cost of Pie(s)
1	1	5
2	2	10
3	4	20
4	8	40
5		
6		
7		
8		
9		
10		
total		

d. Write an explicit formula for the pies sold on day two, as well as the cost of the pies each day.

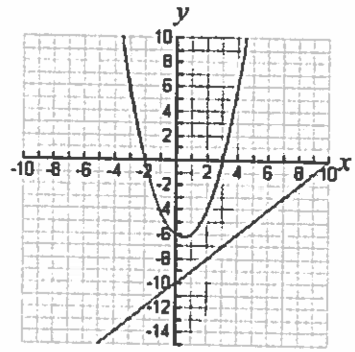
8. Compare the pies sold and the amount earned from the pies on day one to that of day two (compare the situations modeled and use key features of the functions to make your comparison).

9. Did Larry, Curly, and Moe earn enough in two days to fund their project? Consider costs incurred to bake the pies. Justify your reasoning.

<table>
<tr>
<td><u>Find the solutions to the system of equatinos</u></td>
<td>
• Graphically: Find the intersection on the graph

• Algebraically: use either substitution or elimination
</td>
<td>
6. $y = 2x + 10$
$y = -4x - 26$

7. $y = x^2 + 4x - 9$
$y = 3x + x^2 - 12$



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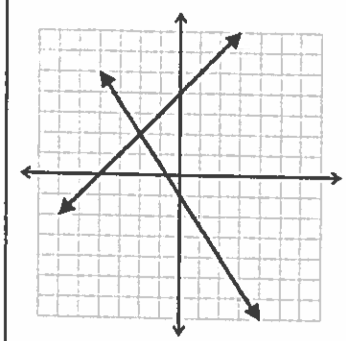

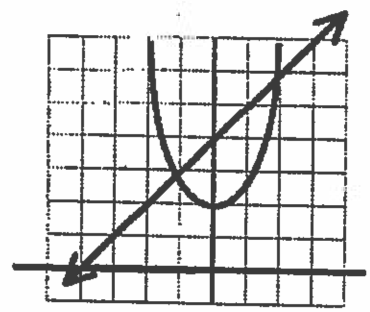
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<tr>
<td><u>Sequences:</u>

<u>Arithmetic and Geometric</u></td>
<td>
Arithmetic
• Common difference, add or subtract by the same number
• $A_n = dn + a_0$
OR
$A_n = a_1 + d\ (n - 1)$

Geometric
• Each term is multiplied by a common ratio

• $A_n = a_1\ (r)^{n-1}$
</td>
<td>
Write the equation for the sequence
8. 12, 16, 20, 24....

9. 120, 60, 30, 15...

10. 21, 18, 15, 12...

11. 12, 24, 48...
</td>
<td>
Find the indicated term:

12. $A_n = 6n + 5$
Find a_{11}

13. $A_n = \frac{1}{2}\ (4)^{n-1}$
Find a_{15}
</td>
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