1.1

READY, SET, GO! Name Period Date

READY

Topic: Distributive Property

Simplify the following expressions

1. $3(2x+7)$ **Answer: 6x+21**
2. $-12(5x-4)$ [redacted]
3. $5a(-3a+13)$ **Answer: -15a²+65a**
4. $9x(6x-2)$ [redacted]
5. $\frac{2x}{3}(12x+18)$ **Answer: 8x²+12x**
6. $\frac{4a}{5}(10a-25b)$ [redacted]
7. $\frac{-4x}{11}(121x+22)$ **Answer: -44x² - 8x**

SET

Topic: Recognizing Linear Exponential and Quadratic Functions

In each set of 3 functions, one will be linear and one will be exponential. One of the three will be a new category of function. List the characteristics in each table that helped you to identify the linear and the exponential functions. What are some characteristics of the new function? Find an explicit and recursive equation for each.

8. Linear, exponential, or a new kind of function?

a.

x	$f(x)$
6	64
7	128
8	256
9	512
10	1024

Type and characteristics? [redacted]

Explicit equation: [redacted]

Recursive equation: [redacted]

b.

x	$f(x)$
6	36
7	49
8	64
9	81
10	100

Type and characteristics? [redacted]

Explicit equation:

Answer: [redacted]

Recursive equation:

Answer: [redacted]

c.

x	$f(x)$
6	11
7	13
8	15
9	17
10	19

Type and characteristics? [redacted]

Explicit equation:

Answer: [redacted]

Recursive equation:

Answer: [redacted]

9. Linear, exponential, or a new kind of function?

d.

x	$f(x)$
-2	-17
-1	-12
0	-7
1	-2
2	3

Type and characteristics?
Answer: Difference of 5 between outputs, Linear.
Explicit equation:
Answer: $f(x) = 5x - 7$
Recursive equation:
Answer: $f(x) = f(x-1) + 5$, $f(1) = -2$

e.

x	$f(x)$
-2	1/25
-1	1/5
0	1
1	5
2	25

Type and characteristics?
Answer: Ratio of 5 between outputs, Exponential.
Explicit equation:
Answer: $f(x) = 5^x$
Recursive equation:
Answer: $f(x) = f(x-1) \cdot 5$, $f(1) = 5$

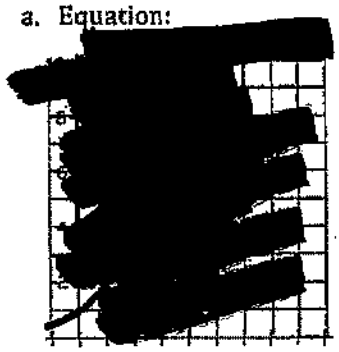
f.

x	$f(x)$
-2	9
-1	6
0	5
1	6
2	9

Type and characteristics?
Answer: Different amounts being added, new kind.
Explicit equation:
Answer: $f(x) = x^2 + 5$
Answer: Different, not expected students can create yet.
Recursive equation:
Answer: $f(x) = f(x-1) + 2x - 1$, $f(1) = 6$

10. Graph the functions from the tables in #8 and #9. Add any additional characteristics you notice from the graph. Place your axes so that you can show all 5 points. Identify your scale. Write your explicit equation above the graph.

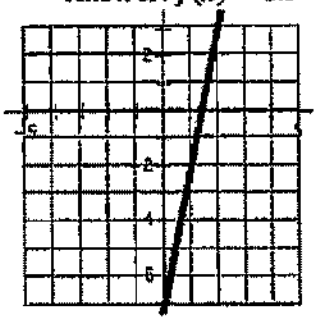
a. Equation:



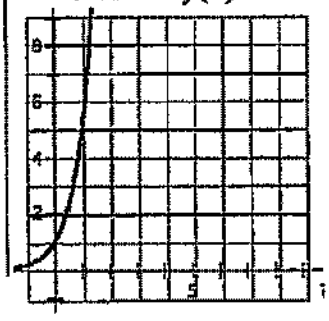
b. Equation:**Answer**

Equation:**Answer**

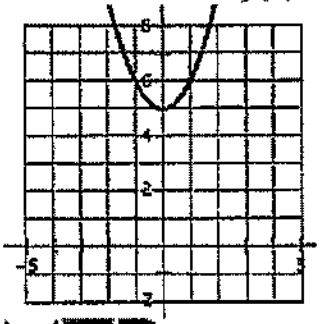
d. Equation:
Answer: $f(x) = 5x - 7$



e. Equation:
Answer: $f(x) = 5^x$



f. Equation:
Answer: $f(x) = x^2 + 5$



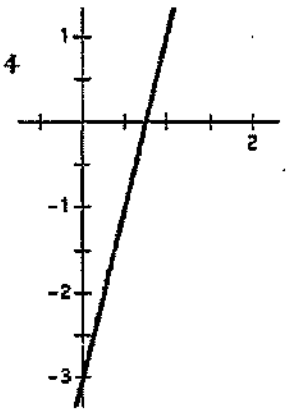
GO

Topic: Rates of Change

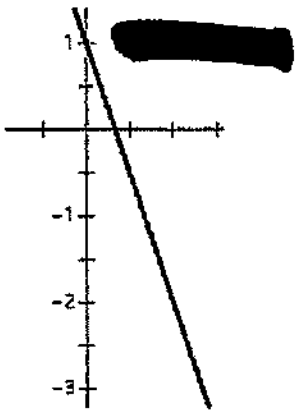
Identify the rate of change in each of the representations below.

11.

Answer: 4



12.



13.

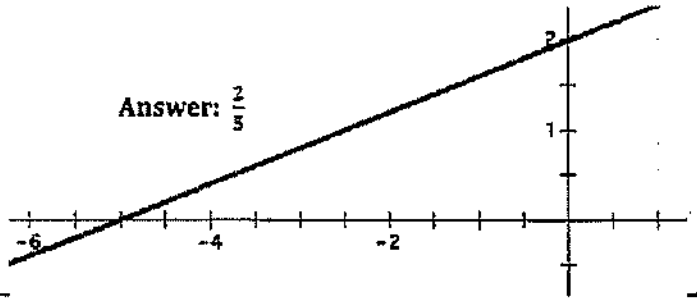
x	f(x)
25	65
26	68
27	71
28	74

Answer: 3

14.

$f(0) = 7; f(n+1) = f(n) + 5$

15.



Answer: $\frac{2}{5}$

16.

Slope of $\overline{AB}$

A(-3, 12) B(-11, -16)

17. George is loading freight into an elevator. He notices that the weight limit for the elevator is 1000 lbs. He knows that he weighs 210 lbs. He has loaded 15 boxes into the elevator. Each box weighs 50 lbs. Identify the rate of change for this situation. **Answer: 50 lbs per box**

18.

Independent variable	4	5	6	7	8
Dependent variable	5	5.5	6	6.5	7

19.

$f(-4) = 24$ *and* $f(6) = -36$

Answer: -6

1.2

READY, SET, GO!

Name Period Date

READY

Topic: Distributive Property

Simplify. First use the distributive property and then combine the like terms.

Example:

$3x(4x+1)+2(4x+1) \rightarrow (12x^2+3x)+(8x+2) \rightarrow 12x^2+[3x+8x]+2 \rightarrow 12x^2+11x+2$

like terms

Simplified form

1. $2x(5x+3)+7(5x+3)$

   Answer: $10x^2+41x+21$

2. $8x(x+1)+2(x+1)$

   [redacted]

3. $6x(x-10)-1(x-10)$

   Answer: $6x^2-61x+10$

4. $1x(3x+4)+5(3x+4)$

   [redacted]

5. $3x(8x+3)-4(8x+3)$

   Answer: $24x^2-23x-12$

6. $5x(2x+6)+2(2x+6)$

   [redacted]

7. $7x(-5x+2)-13(-5x+2)$

   Answer: $-35x^2+79x-26$

8. $-4x(12x+3)+3(12x+3)$

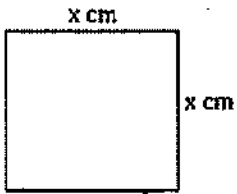
   [redacted]

SET

Topic: Comparing Area and perimeter

Calculate the area and perimeter of each figure below. The area may be written as a product. Include the correct unit on your answer. (Your answers will contain a variable.)

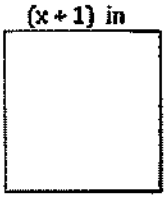
9.



a. Perimeter: **Answer:** $4x$ cm

b. Area: **Answer:** x^2 cm^2

10.



a. Perimeter: [redacted]

b. Area: [redacted]

Need help? Visit www.rsgsupport.org

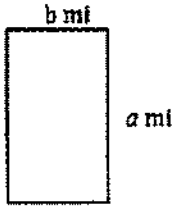
mathematics vision project

11.

a. Perimeter: Answer: $2a + 2b + 16$ ft

b. Area: Answer: $(a + 5)(b + 3)$ ft^2
or $ab + 3a + 5b + 15$ ft^2

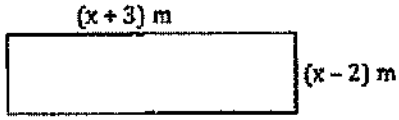
12.



a. Perimeter: [redacted]

b. Area: [redacted]

13.



a. Perimeter: Answer: $4x + 2$ m

b. Area: Answer: $(x + 3)(x - 2)$ m^2
or $x^2 + x - 6$ m^2

14.

a. Perimeter: [redacted]

b. Area: [redacted]

15. Compare the perimeter to the area in each of problems (9-14).

In what way are the numbers and units in the perimeters and areas different?

Answer: Perimeter comes from standards units while area is measured with square units. Perimeter comes from the sum of the side lengths while area is the product of length and width.

GO

Topic: Greatest Common Factor

Find the GCF for the given terms.

16. $15abc^2$ and $25a^3bc$ [redacted]

17. $12x^5y$ and $32x^6y$
Answer: $4x^5y$

18. $17pqr$ and $51pqr^8$ [redacted]

19. $7x^2$ and $21x$
Answer: $7x$

20. $6x^2$, $18x$, and -12 [redacted]

21. $4x^2$ and $9x$
Answer: x

22. $11x^2y^2$, $33x^2y$, and $3xy^2$ [redacted]

23. $16a^2b$, $24ab$, and $16b$
Answer: $8b$

24. $49s^2t^2$ and $36s^2t^2$ [redacted]

1.3

READY, SET, GO! Name Period Date

READY

Topic: Multiplying two binomials

In the previous RSG, you were asked to use the distributive property on two different terms in the same problem. Example: *Multiply and simplify* $3x(4x + 1) + 2(4x + 1)$.

You may have noticed that the binomial $(4x + 1)$ occurred twice in the problem.

Here is a simpler way to write the same problem: $(3x + 2)(4x + 1)$.

You will use the distributive property twice. First multiply $3x(4x + 1)$; then multiply $+2(4x + 1)$. Add the like terms. Write the x^2 term first, the x-term second, and the constant term last.

$3x(4x + 1) + 2(4x + 1) \rightarrow (12x^2 + 3x) + (8x + 2) \rightarrow 12x^2 + [3x + 8x] + 2 \rightarrow 12x^2 + 11x + 2$

like terms

Simplified form

Multiply the two binomials. (Your answer should have 3 terms and be in this form $ax^2 + bx + c$.)

1. $(x + 5)(x - 7)$
   Answer: $x^2 - 2x - 35$
2. $(x + 8)(x + 3)$
   [redacted]
3. $(x - 9)(x - 4)$
   Answer: $x^2 - 13x + 36$
4. $(x + 1)(x - 4)$
   [redacted]
5. $(3x - 5)(x - 1)$
   Answer: $3x^2 - 8x + 5$
6. $(5x - 7)(3x + 1)$
   [redacted]
7. $(4x - 2)(8x + 10)$
   Answer: $32x^2 + 24x - 20$
8. $(x + 6)(-2x + 5)$
   [redacted]
9. $(8x - 3)(2x - 1)$
   Answer: $16x^2 - 14x + 3$

SET

Topic: Distinguishing between linear and quadratic patterns

Use first and second differences to identify the pattern in the tables as *linear*, *quadratic*, or *neither*. Write the recursive equation for the patterns that are linear or quadratic.

10.

x	y
-3	-23
-2	-17
-1	-11
0	-5
1	1
2	7
3	13

a. Pattern: [redacted]
b. Recursive equation: [redacted]

11.

x	y
-3	4
-2	0
-1	-2
0	-2
1	0
2	4
3	10

a. Pattern: **Answer: Quadratic**
b. Recursive equation:
Answer: $f(n) = f(n-1) + 2n$
$f(1) = 0$

12.

x	y
-3	-15
-2	-10
-1	-5
0	0
1	5
2	10
3	15

a. Pattern: [redacted]
b. Recursive equation: [redacted]

13.

x	y
-3	24
-2	22
-1	20
0	18
1	16
2	14
3	12

a. Pattern: **Answer: Linear**
b. Recursive equation:
Answer: $f(n) = f(n-1) - 2$

14.

x	y
-3	48
-2	22
-1	6
0	0
1	4
2	18
3	42

a. Pattern: [redacted]
b. Recursive equation:
Answer: [redacted]

15.

x	y
-3	4
-2	1
-1	0
0	1
1	4
2	9
3	16

a. Pattern: **Answer: Quadratic**
b. Recursive equation:
Answer: $f(n) = f(n-1) + 2n + 1$
$f(1) = 4$

16. $f(1) = 16$

Figure 1 Figure 2 Figure 3 Figure 4

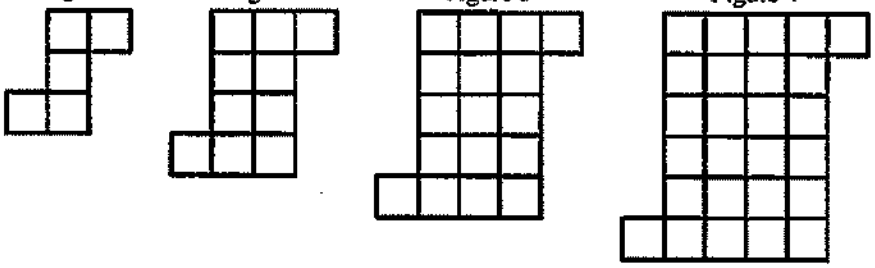


Figure 5

a. Draw figure 5.
b. Predict the number of squares in figure 30. Show what you did to get your prediction.

[redacted]

GO
Topic: Interpreting recursive equations to write a sequence

Write the first five terms of the sequence.

17. $f(0) = -5; f(n) = f(n-1) + 8$

Answer: -5, 3, 11, 19, 27, 35, ...

18. $f(0) = 24; f(n) = f(n-1) - 5$

[redacted]

19. $f(0) = 25; f(n) = 3f(n-1)$

Answer: 25, 75, 225, 675, 2025, ...

20. $f(0) = 6; f(n) = 2f(n-1)$

[redacted]

1.4

READY, SET, GO! Name Period Date

READY

Topic: Applying slope formula

Calculate the slope of the line between the given points. Use your answer to indicate which line is the steepest.

1. A (-3, 7) B (-5, 17)

   Answer: -5

2. H (12, -37) K (4, -3)

   [redacted]

3. P (-11, -24) Q (21, 40)

   Answer: 2

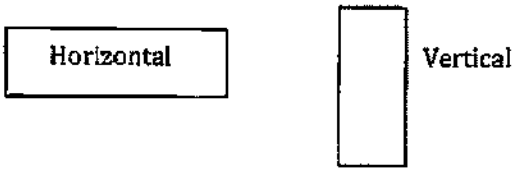
4. R (55, -75) W(-15, -40)

   [redacted]

SET

Topic: Investigating perimeters and areas

Adam and his brother are responsible for feeding their horses. In the spring and summer the horses graze in an unfenced pasture. The brothers have erected a portable fence to corral the horses in a grazing area. Each day the horses eat all of the grass inside the fence. Then the boys move it to a new area where the grass is long and green. The porta-fence consists of 16 separate pieces of fencing each 10 feet long. The brothers have always arranged the fence in a long rectangle with one length of fence on each end and 7 pieces on each side making the grazing area 700 sq. ft. Adam has learned in his math class that a rectangle can have the same perimeter but different areas. He is beginning to wonder if he can make his daily job easier by rearranging the fence so that the horses have a bigger grazing area. He begins by making a table of values. He lists all of the possible areas of a rectangle with a perimeter of 160 ft, while keeping in mind that he is restricted by the lengths of his fencing units. He realizes that a rectangle that is oriented horizontally in the pasture will cover a different section of grass than one that is oriented vertically. So he is considering the two rectangles as different in his table. Use this information to answer questions 5 – 9 on the next page.



mathematics vision project

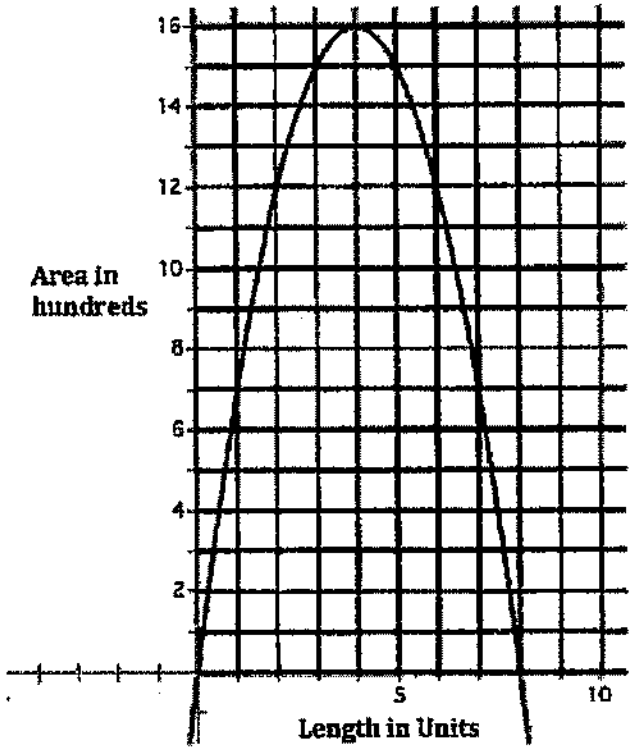
5. Fill in Adam's table with all of the arrangements for the fence. (The first one is done for you.)

	Length in fencing" units	Width in "fencing" units	Length in ft.	Width in ft.	Perimeter (ft)	Area $(ft)^2$
	1 unit	7 units	10 ft	70 ft	160 ft	700 ft^2
a.	2 units	6	20	60	160 ft	1200
b.	3 units	5	30	50	160 ft	1500
c.	4 units	4	40	40	160 ft	1600
d.	5 units	3	50	30	160 ft	1500
e.	6 units	2	60	20	160 ft	1200
f.	7 units	1	70	10	160 ft	700

6. Discuss Adam's findings. Explain how you would rearrange the sections of the porta-fence so that Adam will be able to do less work.

[redacted]

7. Make a graph of Adam's investigation. Let length be the independent variable and area be the dependent variable. Label the scale.



8. What is the shape of your graph?

[redacted]

9. Explain what makes this function be a quadratic. **Answer: Parabola or second differences are the same.**

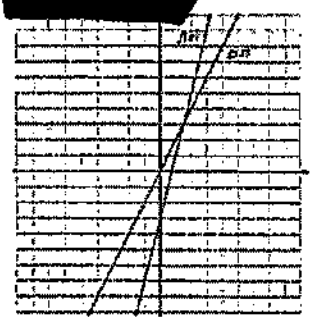
1.4

GO

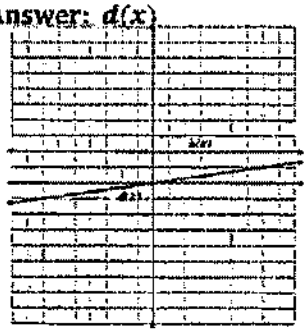
Topic: Comparing linear and exponential rates of change

Indicate which function is changing faster.

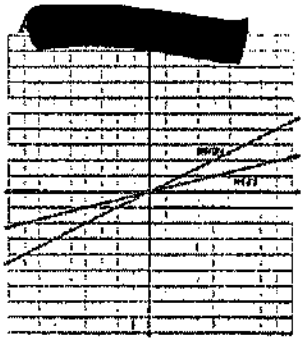
10. [redacted]



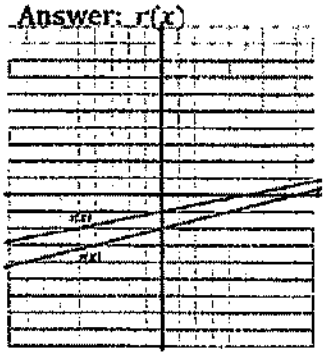
11. Answer: $d(x)$



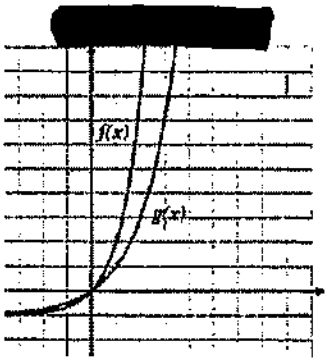
12. [redacted]



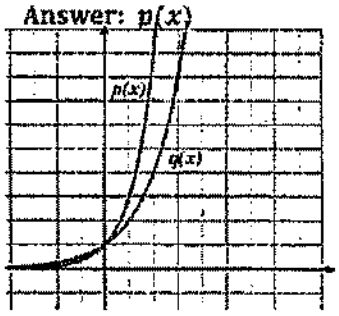
13. Answer: $r(x)$

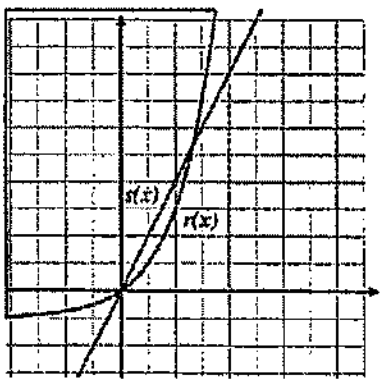


14. [redacted]



15. Answer: $p(x)$





16 a. Examine the graph at the left from 0 to 1.

Which graph do you think is growing faster?

[redacted]

b. Now look at the graph from 2 to 3.

Which graph is growing faster in this interval?

[redacted]

1.5

READY, SET, GO! Name Period Date

READY

Topic: Recognizing Functions

Identify which of the following representations are functions. If the representation is NOT a function state how you would fix it so it was.

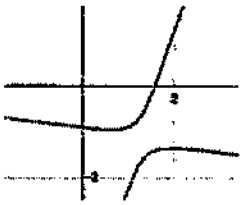
1. D = {(4,-1) (3, -6) (2, -1) (1, 2) (0, 4) (2, 5)}
   Answer: Not a functions change (2,-1) or (2,5)

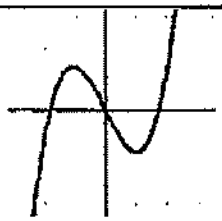
2. The number of calories you have burned since midnight at any time during the day.

3. 
   Answer: Function

4.

x	-12	-8	-6	-4
f(x)	25	25	25	25

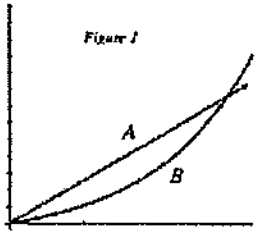
5. 
   Answer: Not a functions, remove a piece of the graph so each input has just one output.

6. 

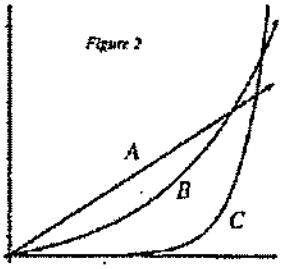
SET

Topic: Comparing rates of change in linear, quadratic, and exponential functions

The graph at the right shows a time vs. distance graph of two cars traveling in the same direction along the freeway.



7. Which car has the cruise control on? How do you know?
   Answer: A, constant rate or straight line.
8. Which car is accelerating? How do you know?
9. Identify the interval in *figure 1* where car A seems to be going faster than car B.
   Answer: From 0 to 6 or in interval notation (0,6)
10. For what interval in *figure 1* does car B seem to be going faster than car A?
11. What in the graph indicates the speed of the cars?
    Answer: Steepness of the line.
12. A third car *C* is now shown in the graph (*see figure 2*). All 3 cars have the same destination. If the destination is a distance of 12 units from the origin, which car do you predict will arrive first? Justify answer.



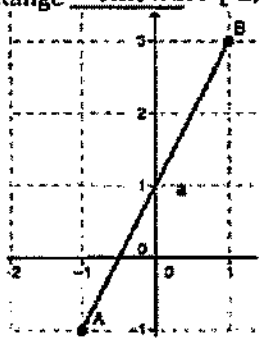
mathematics vision project

GO

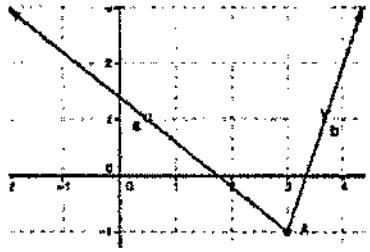
Topic: Identifying domain and range from a graph

State the domain and range of each graph. Use interval notation where appropriate.

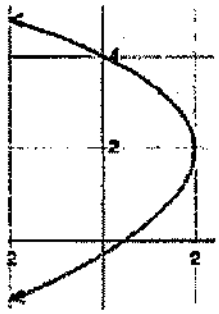
13a. Domain Answer: [-1, 1]
b. Range Answer: [-1, 3]



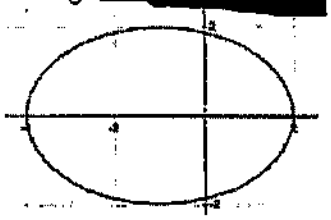
14a. Domain [redacted]
b. Range [redacted]



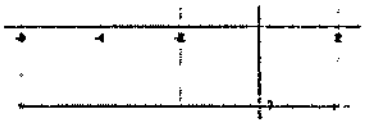
15a. Domain Answer: (-∞, 2]
b. Range Answer: (-∞, ∞)



16a. Domain [redacted]
b. Range [redacted]

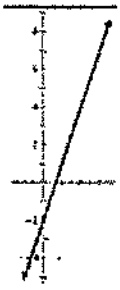


17a. Domain Answer: [-6, ∞)
b. Range Answer: [-2]



18a. Domain [redacted]
b. Range [redacted]

19a. Domain Answer: (-∞, ∞)
b. Range Answer: (-∞, ∞)



20a. Domain [redacted]
b. Range [redacted]

21. Are the domains of #19 and #20 the same? Explain.

Answer: No, one is all real numbers and includes many values. The other is discrete.

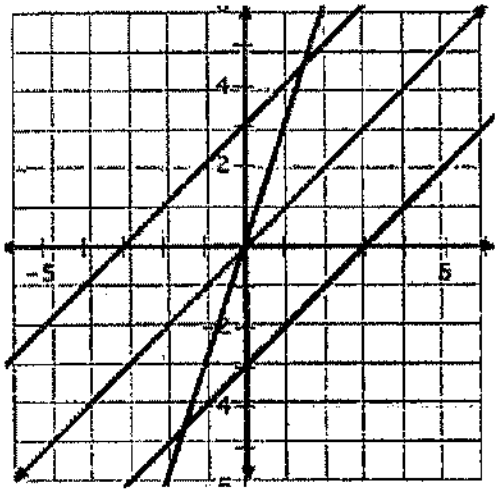
1.6

READY, SET, GO! Name Period Date

READY

Topic: Transforming lines

1. Graph the following linear equations on the grid. The equation y = x has been graphed for you. For each new equation explain what the number 3 does to the graph of y = x. Pay attention to the y-intercept, the x-intercept, and the slope. Identify what changes in the graph and what stays the same.



a. y = x + 3

Answer: The slope is the same, all output values are three higher then they were before.

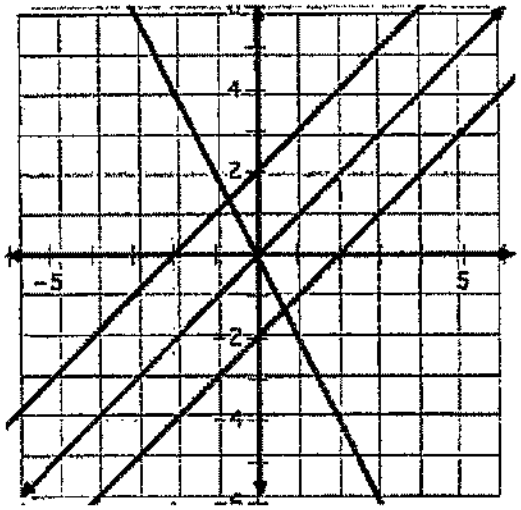
b. y = x - 3

Answer: The slope is the same, all output values are three less then they were before.

c. y = 3x

Answer: The slope is steeper, all output values are three times what they were before.

2. The graph of y = x is given. (*See figure 2.*) For each equation predict what you think the number -2 will do to the graph. Then graph the equation.



a. y = x + (-2)
Prediction:

b. y = x - (-2)
Prediction:

c. y = -2x
Prediction:

1.6

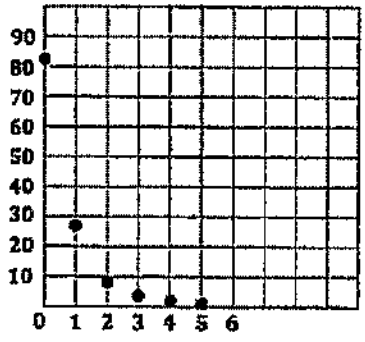
SET

Topic: Distinguish between linear, exponential and quadratic functions

For each relation given:

a. **Identify whether or not the relation is a function. (If it's not a function, skip b – d.)**
b. **Determine if the function is Linear, Exponential, Quadratic or Neither.**
c. **Describe the type of growth.**
d. **Express the relation in the indicated form.**

3. I had 81 freckles on my nose before I began using vanishing cream. After the first week I had 27, the next week 9, then 3 . . .



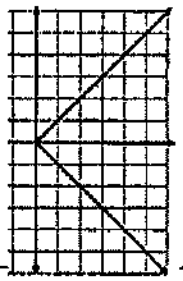
a. Function? **Answer: Yes**
b. Linear, Exponential, Quadratic or Neither
c. How does it grow? **Answer: Each stage or week is a $\frac{1}{3}$ the previous**
d. Make a graph. Label your axes and the scale Show all 4 points.

4.

x	y
0	81
1	$80\frac{2}{3}$
2	$80\frac{1}{3}$
3	80
4	$79\frac{2}{3}$

[redacted]

5.



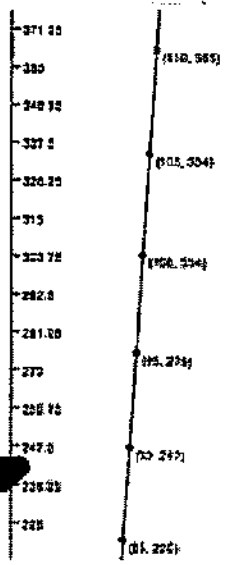
a. Function? **Answer: No**
b. Linear, Exponential, Quadratic or Neither
c. How does it grow?
d. Create a table

0	0
1	1
1	-1

---

6. Speed in mph of a baseball vs. distance in ft.

[redacted]



Answer: It increases by more and more. The 1st difference is linear, 2nd differences are the same.

mathematics vision project

1.6

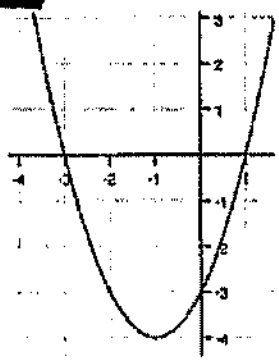
GO

Topic: Matching function representations

Match the function on the left with the equivalent function on the right.

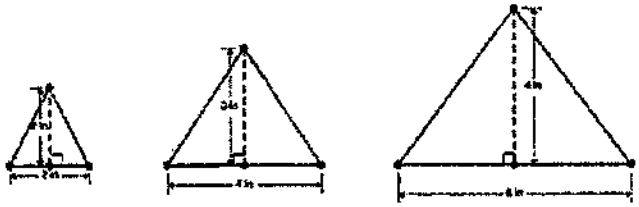
d 7. $f(x) = -2x + 5$

[redacted]



g 9. I put $7000 in a savings account that pays 3% interest compounded annually. I plan to leave it in the bank for 20 years. The amount I will have then.

[redacted]he area of the triangles below.



a 11. $f(0) = 5; f(n) = 2 * f(n-1)$

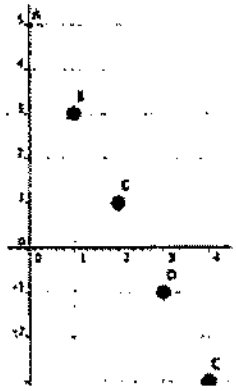
[redacted] $f(0) = 5; f(n) = f(n-1) - 2$

e 13.

x	-7.75	-¼	½	11.6
$f(x)$	7.75	¼	-½	-11.6

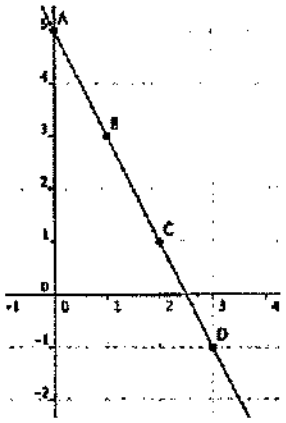
a. $f(x) = 5(2)^x$

b.



c. $f(1) = 2;\ f(n+1) = f(n) + 2n + 2$

d.



e. $y + x = 0$

f. $y = (x-1)(x+3)$

g. $A = 7000(1.03)^{20}$