

Functions

(Part II)

At the end of this unit I will be able to:

Describe what a function is

Name the different ways to represent a function.

Describe how to compare functions.

Describe and graph a linear function.

Determine if a function is linear or not from an equation or a graph

Analyze a graph

* Relations and Functions: What is a function? *

- A _____ is a set of ordered pairs.
- A _____ is a relation where every input (x) has exactly one output (y).

Let's look at a few examples of relations. Some are functions and some are not.

Example 1:

State	Capital
New Jersey	Trenton
New York	Albany
Colorado	Denver
Rhode Island	Providence

- This relation _____ a function

Why?

Example 2:

Person	Grandparent
Eric	Arthur
Eric	Ellie
Maria	Camie
Maria	Susan

- This relation _____ a function

Why?

Example 3:

x	y
5	7
2	9
0	8
-4	6

- This relation _____ a function.

Why?

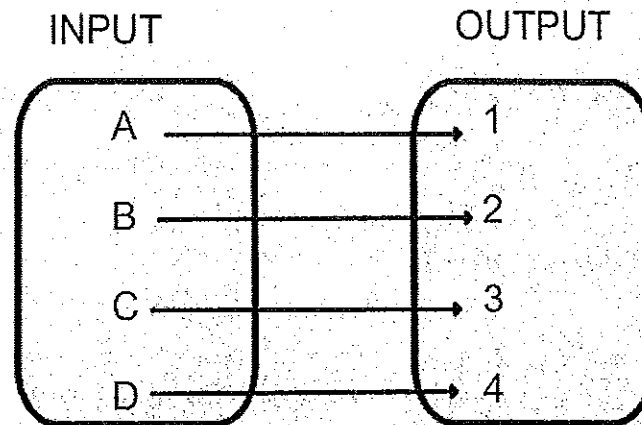
Example 4:

x	y
4	3
2	8
0	8
4	6

- This relation _____ a function.

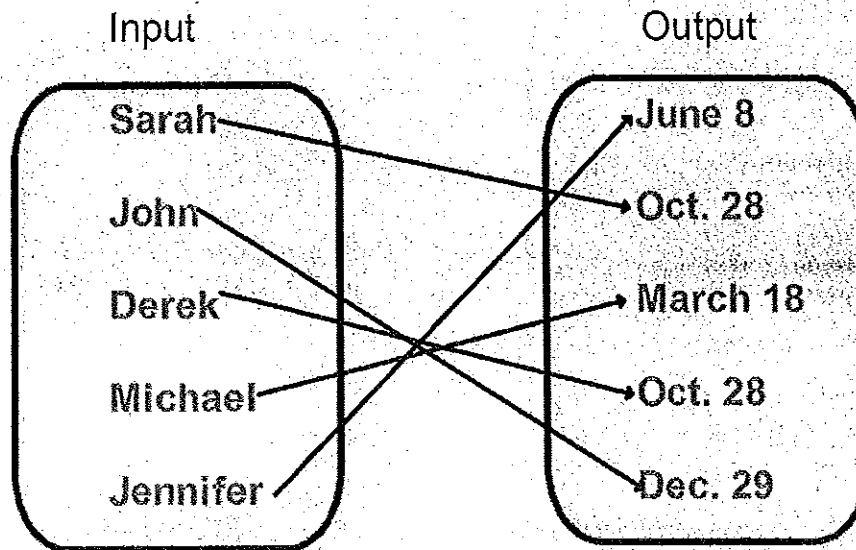
Why?

Another way to represent a function is a function map



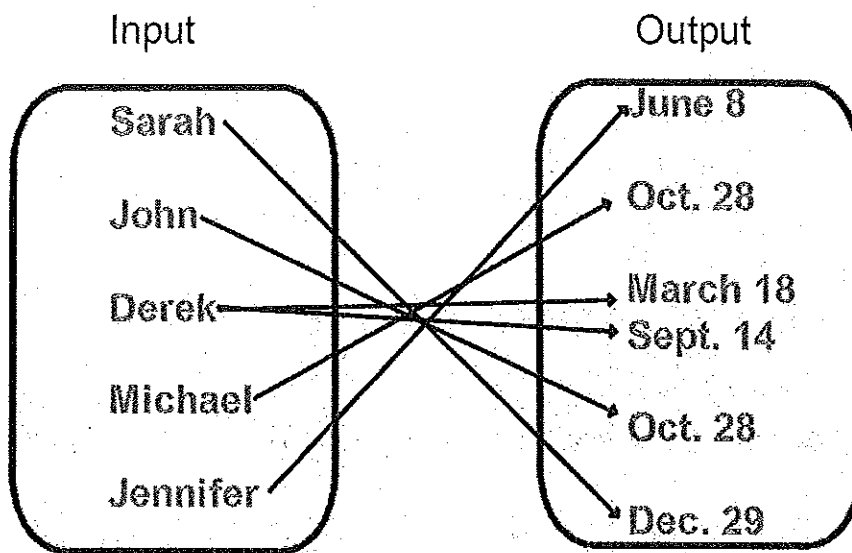
Arrows extend from each Input to the corresponding Output

An arrow is drawn from each input to its matching output.

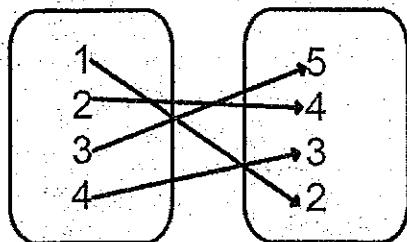


This relation about birthdays _____ a function,
even though two people have _____
birthday.

This relation _____ show a function.



Why?



Is this relation a Function?

Another way to see functions is in a set of ordered pairs.

- x-values are the input
- y-values are the output
- put them in a table or a map to see if it's a function:

(x,y)

$\{(2, 6), (3, 7), (4, 8), (5, 9)\}$

x	y
2	6
3	7
4	8
5	9

This set _____ a function.

✓ Test yourself: Are these functions?

1.

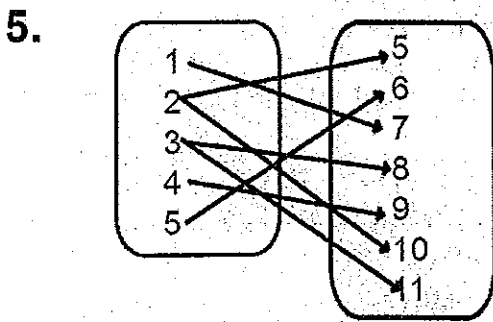
x	y
1	2
5	7
9	2
13	6
17	5

2. $\{(1, 2), (2, 3), (3, 4), (4, 5)\}$

3.

x	y
3	2
4	5
4	7
9	6
9	12

4. Any number times 3.



6. $\{(1, 2), (2, 3), (3, 4), (4, 5)\}$

7. $\{(1, 2), (1, 3), (2, 4), (3, 4), (3, 5)\}$

8.

City	State
Englewood	New Jersey
Englewood	Colorado
Springfield	Maryland
Springfield	Illinois
Springfield	Montana

Name: _____

I will be able to determine if a relation is a function.

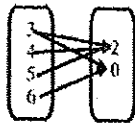
Relations & Functions

Determine if the relation is a function.

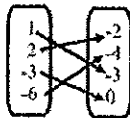
1. (1,2) (2,3) (3,4) (4,5) _____

2. (4,5) (3,5) (2,1) (5,8) _____

3. _____



4. _____



5. _____

x	y
0	2
0	3
2	4

6. _____

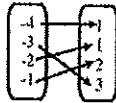
x	y
1	8
3	4
5	4

Pets and Colors	
Colors	Pets
orange	cat
blue	dog
orange	fish
green	gerbil
yellow	rat
red	snake

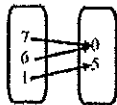
7. _____

8. (3,5) (10,-5) (-4,8) (0,5) _____

9. (0,1.5) (2, 2.1) (0,4) (6, .5) _____



10. _____



11. _____

x	y
-3	2
-3	5
-4	1

12. _____

x	y
-7	9
-6	8
-5	8

13. (Trenton, NJ) (Newark, NJ) (Cherry Hill, NJ) _____



Lesson Objectives

Identify functions; Find the domain and range of relations and functions

Vocabulary

relation (p. 236): _____

domain (p. 236): _____

range (p. 236): _____

function (p. 237): _____

Key Concepts

Think and Discuss (p. 238)

Get Organized Explain when a relation is a function and when it is not a function.

A relation is ...	
A function if ...	Not a function if ...

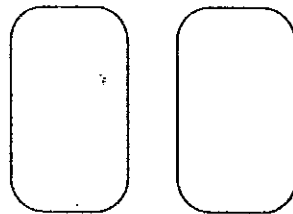
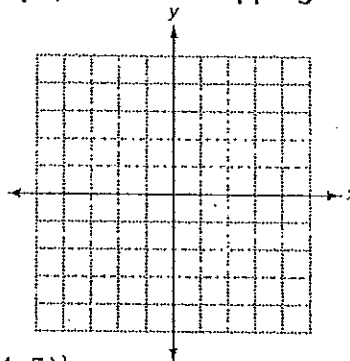


LESSON
4.2 **Practice B**
Relations and Functions

Express each relation as a table, as a graph, and as a mapping diagram.

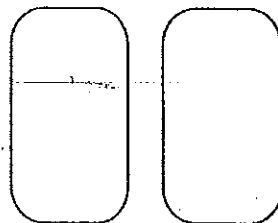
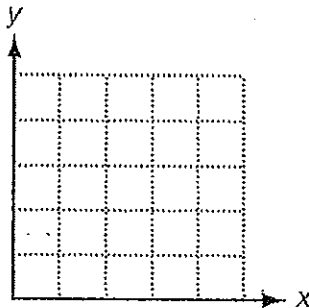
1. $\{(-5, 3), (-2, 1), (1, -1), (4, -3)\}$

x	y

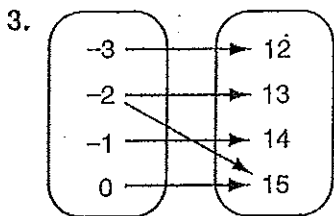


2. $\{(4, 0), (4, 1), (4, 2), (4, 3), (4, 4), (4, 5)\}$

x	y



Give the domain and range of each relation. Tell whether the relation is a function. Explain.

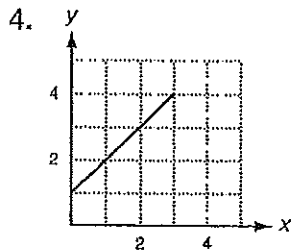


D: _____

R: _____

Function? _____

Explain: _____



D: _____

R: _____

Function? _____

Explain: _____

5.

x	y
8	8
6	6
4	4
2	6
0	8

D: _____

R: _____

Function? _____

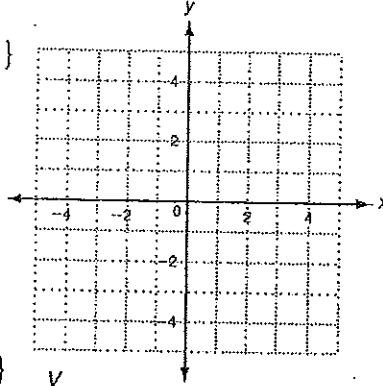
Explain: _____

LESSON
4.2 **Practice A**
Relations and Functions

Express each relation as a table, as a graph, and as a mapping diagram.

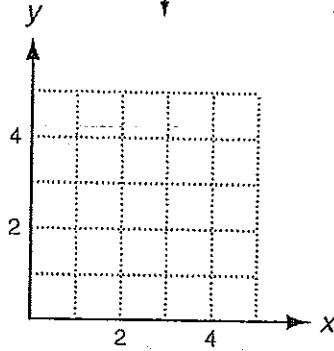
1. $\{(-2, 5), (-1, 1), (3, 1), (-1, -2)\}$

x	y

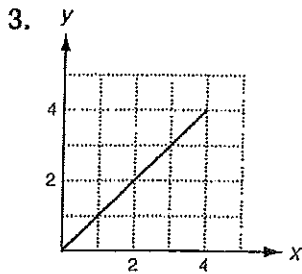


2. $\{(5, 3), (4, 3), (3, 3), (2, 3), (1, 3)\}$

x	y



Give the domain and range of each relation. Tell whether the relation is a function. Explain.

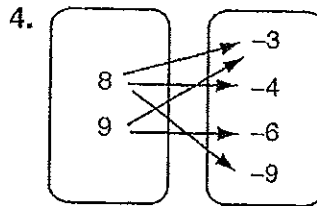


D: _____

R: _____

Function? _____

Explain: _____



D: _____

R: _____

Function? _____

Explain: _____

5.

x	y
1	4
2	5
0	6
1	7
2	8

D: _____

R: _____

Function? _____

Explain: _____

Graphing Functions

I will be able to:

- Complete a function table and graph it.
- decide whether the graph is linear or non-linear
- identify domain and range

Vocabulary Terms You need to know:

- _____: the set of "input" values (usually seen as "x" or "n" or another variable).
- _____: the set of "output" values (usually seen as "y" or "f(n)" or "f(x)", etc).
- *Linear*: a function equation that forms a _____.
- _____: a function equation that is NOT a line.
- *x-intercept*: the point where the graph _____ the _____.
- *y-intercept*: the point where the graph _____ the _____.

■ After graphing, answer this question:

What do you notice about the equations that are non-linear?

Function Tables allow you to organize information

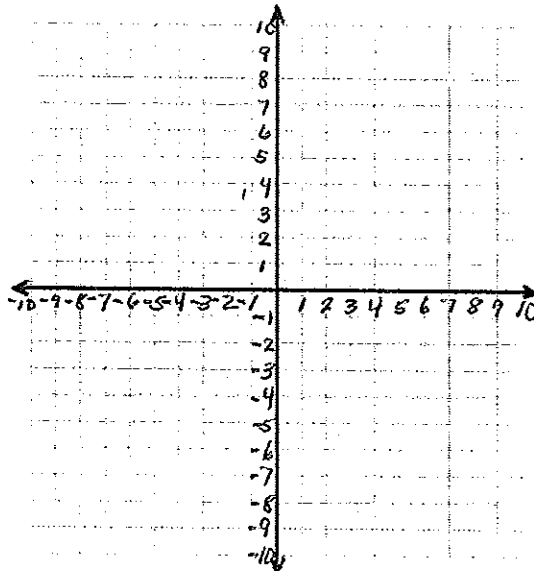
Example 1: $f(n) = 2n - 1$ use domain values: -2, -1, 0, 1, 2

"input" "domain"	"function rule" "equation"	"output" "range"	Ordered Pairs (n, f(n)) - like (x,y) for graphing
n	$2n - 1$	f(n)	(n, f(n))
-2			
-1			
0			
1			
2			

List Domain values:

List Range values:

Linear or non-linear?



Example 2:

$$f(x) = x - 4$$

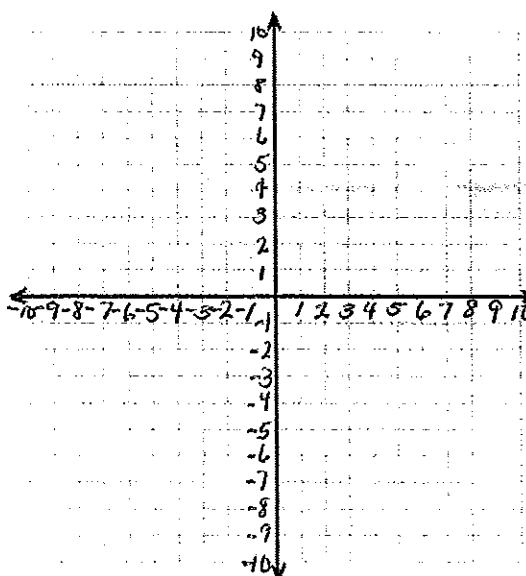
use domain values -1, 0, 2, 3, 5

x	x - 4	f(x)	(x, f(x))

List Domain values:

List Range values:

Linear or non-linear?

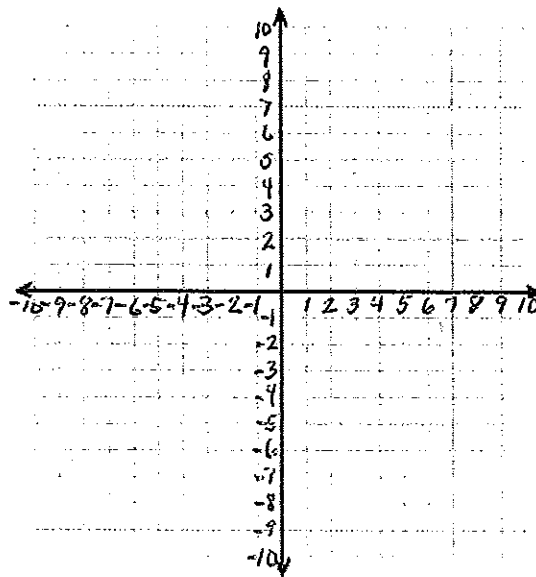


Example 3: $f(a) = a^2 - 1$ use domain values:
-3, -2, -1, 0, 1

List Domain values:

List Range values:

Linear or non-linear?

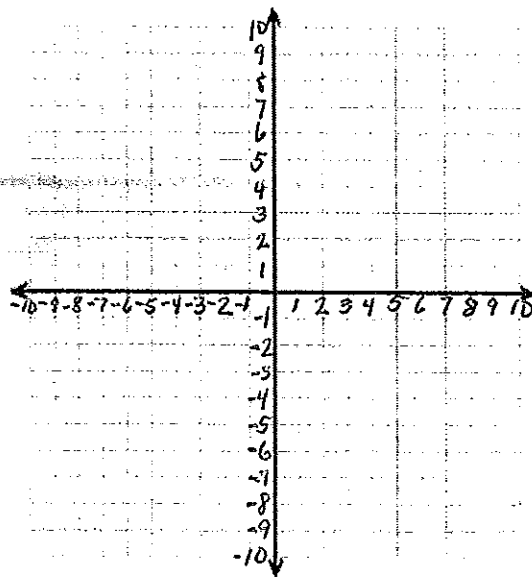


Example 4: $f(h) = h^3$ Use domain values: -2, -1, 0, 1, 2

List Domain values:

List Range values:

Linear or non-linear?

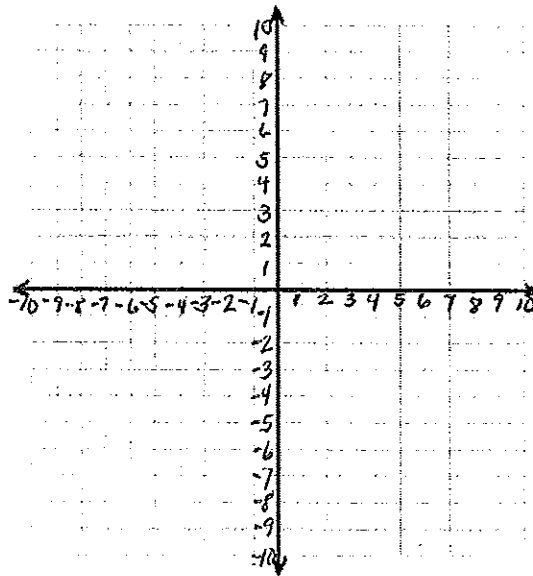


Example 5: $f(b) = \frac{1}{2}b - 2$ Use domain values: -2, -1, 0, 2, 4

List Domain values:

List Range values:

Linear or non-linear?



Domain & Range Homework:

What is the domain of the ordered pairs?

1. $(1,2) (7,7) (-4,-2) (9, 4)$

2.

x	y
0	2
0	3
2	4

What is the range of the ordered pairs?

3. $(1,2) (7,7) (-4,-2) (9, 4)$

4.

x	y
-1	2
0	3
1	4

What is the domain of the ordered pairs?

5. $(3,-3)$ $(-17,2)$ $(12,0)$ $(-6, 7)$

6.

x	y
5	-1
-3	1
-10	6

What is the range of the ordered pairs?

7. $(3,-3)$ $(-17,2)$ $(12,0)$ $(-6, 7)$

8.

x	y
5	-1
-3	1
-10	6

Practice Worksheet 11-1

Functions

Complete each function table.

1. $f(n) = 9n$

n	$9n$	$f(n)$
-2		
-1		
0		
3		
4.5		

2. $f(n) = 3n - 5$

n	$3n - 5$	$f(n)$
-5		
0		
5		
10		
15		

3. $f(n) = n - 4$

n	$n - 4$	$f(n)$
-3		
-1		
0		
1		
3		

4. $f(n) = 6n + 3$

n	$6n + 3$	$f(n)$
-0.2		
0		
1		
0.4		
0.8		

5. $f(n) = 1.3n$

n	$1.3n$	$f(n)$
-2.3		
-1.7		
0.4		
1		
3		

6. $f(n) = -\frac{1}{4}n + 2$

n	$-\frac{1}{4}n + 2$	$f(n)$
-4		
-2		
0		
3.2		
8		

7. Find $f(-5)$ if $f(n) = 2n + 13$.

8. Find $f(\frac{1}{2})$ if $f(n) = -3n - 8$.

9. Find $f(1.3)$ if $f(n) = 1.3h - 0.3$.

10. Find $f(-2.7)$ if $f(n) = -3n + 7$.

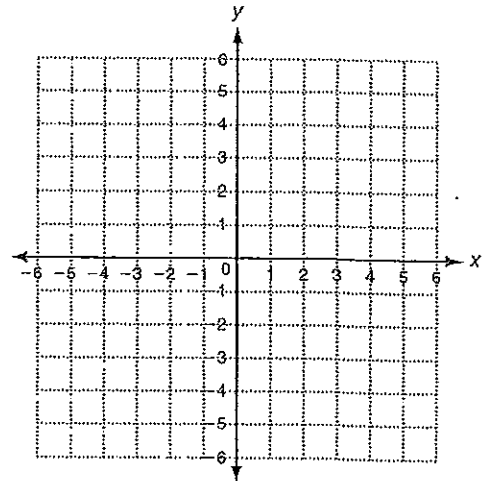
LESSON
4-4

Practice A
Graphing Functions

Graph the function for the given domain.

1. $y = x + 2$; D: $\{-2, -1, 0, 1, 2\}$

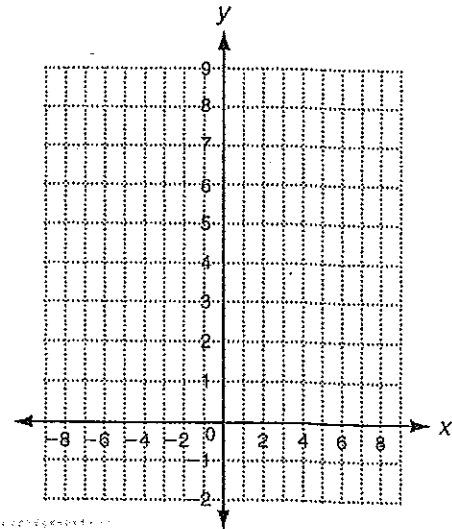
x	$y = x + 2$	y	(x, y)



Graph the function. The domain is all real numbers.

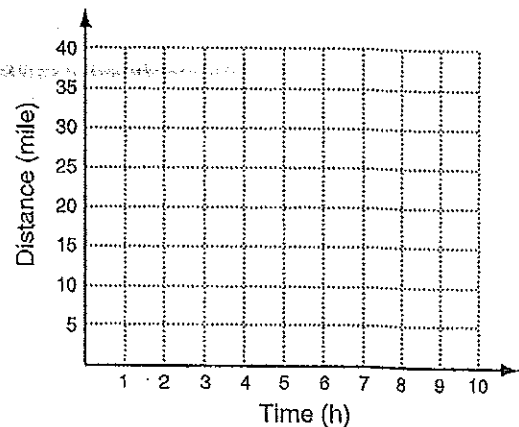
2. $y = x^2 \div 2$

x	$y = x^2 \div 2$	y	(x, y)



3. A Pacific salmon can swim at a maximum speed of 8 mi/h. The function $y = 8x$ describes how many miles y the fish swims in x hours. Graph the function. Use the graph to estimate the number of miles the fish swims in 3.5 hours.

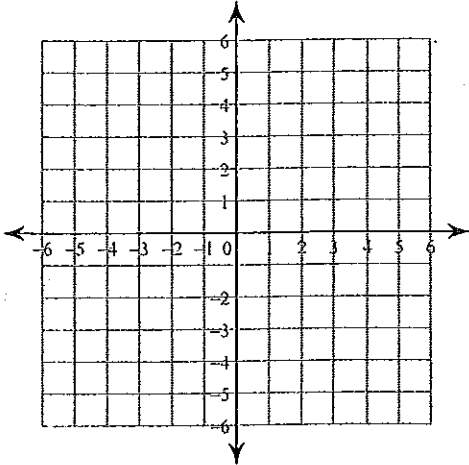
x	$y = 8x$	y	(x, y)



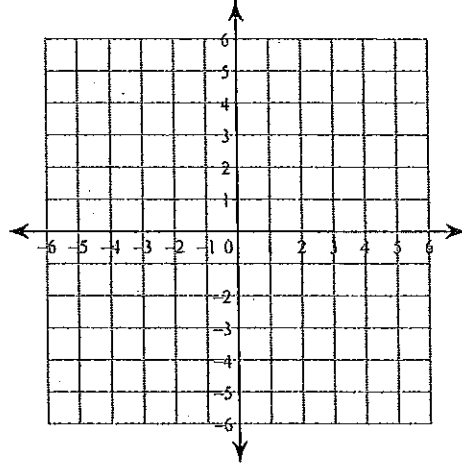
Graphing Lines from a Table

Make a chart and then graph each line. Use -1,0,1 for domain values. Be sure to put arrows on your lines and label the line with the equation.

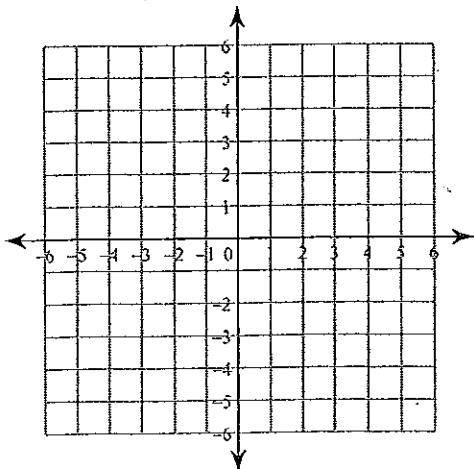
1) $y = -3x - 2$



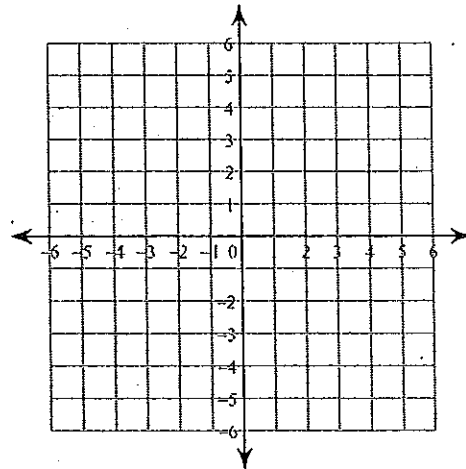
2) $y = x + 1$



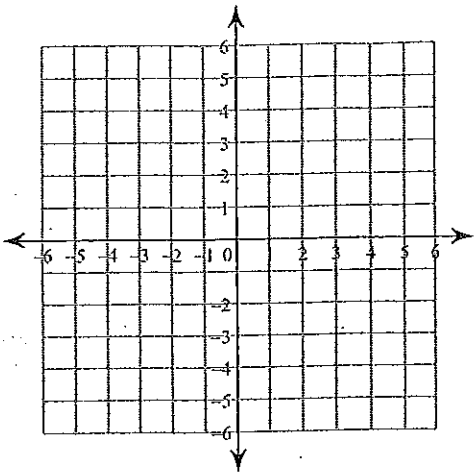
3) $y = 2x + 1$



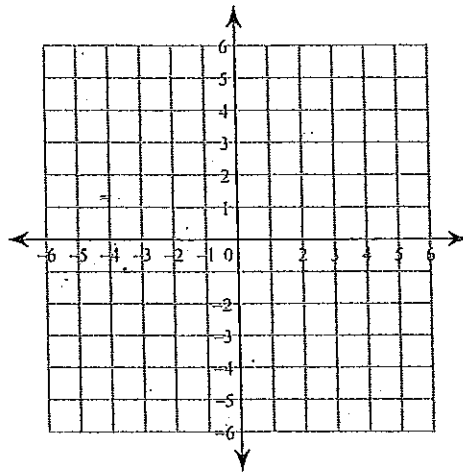
4) $y = x + 3$



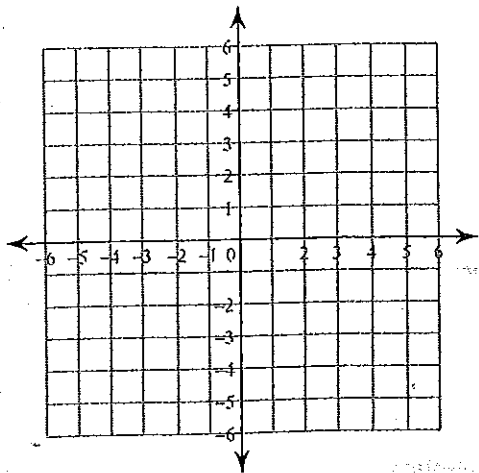
5) $y = -x + 3$



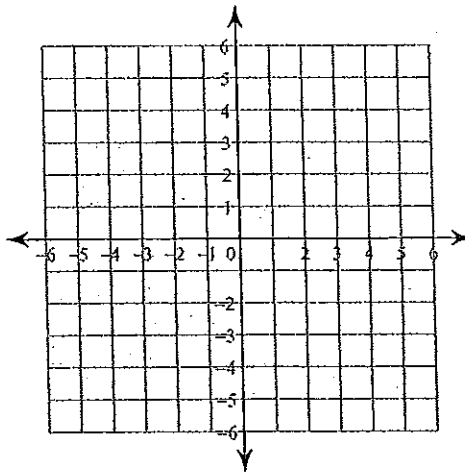
6) $y = 3x - 3$



7) $y = 2x + 2$



8) $y = -3x + 2$



Non-linear functions
Class Work

Name: _____

 Directions:

- Construct a chart for each function: use -2,-1,0,1,and 2 for domain values.
- Graph each function on the separate sheet. Remember: arrows and labels!!!

1. $y = x^2$

2. $f(x) = x^2 - 4$

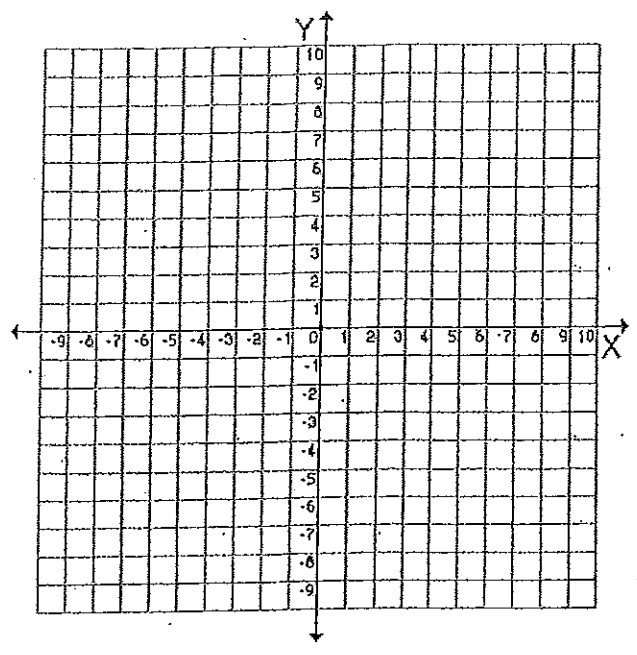


3. $f(g) = g^3 - 1$

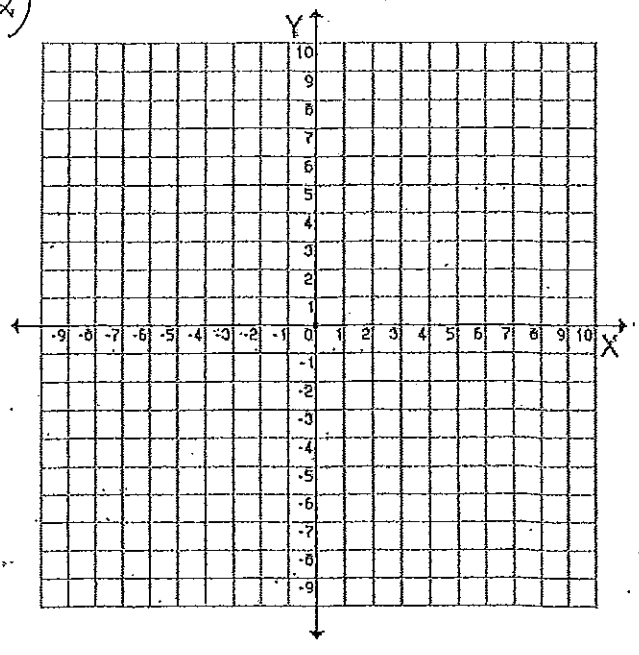
4. $y = x^3 - 2$



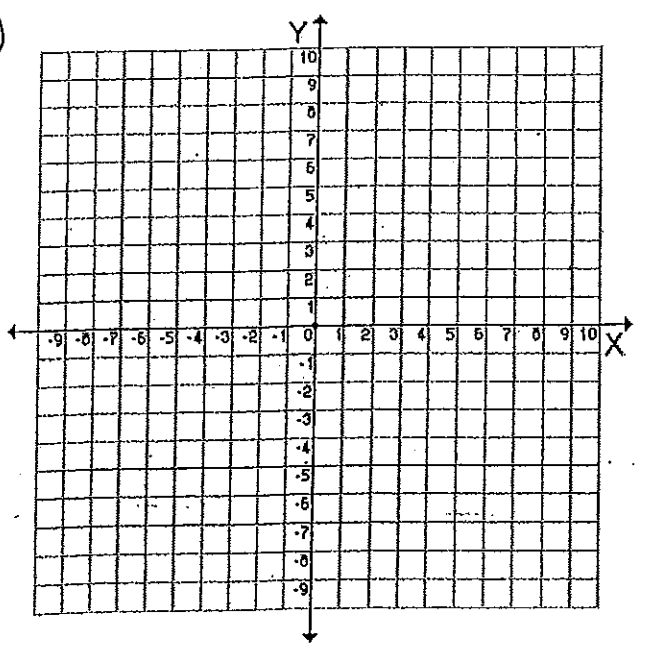
1)



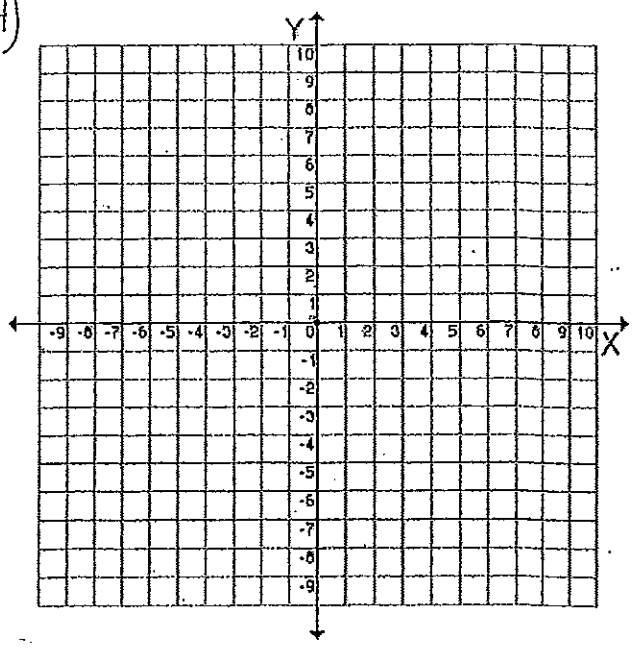
2)



3)



4)



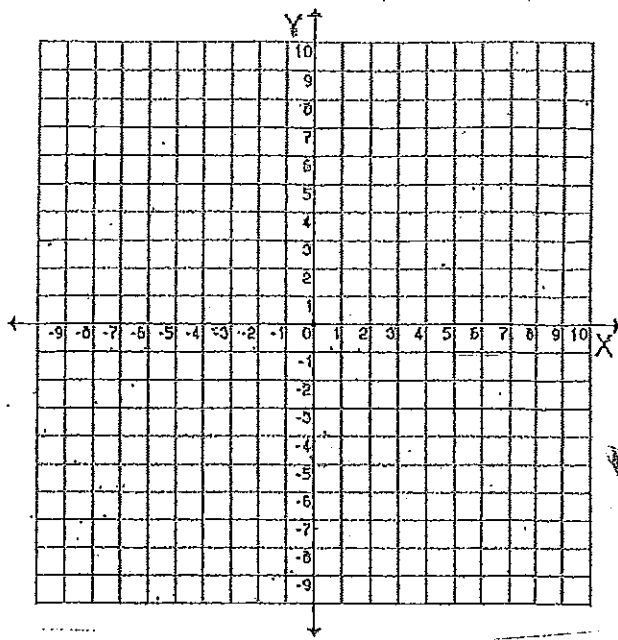
28

~~ANSWERS~~ EQUATIONS PRACTICE (Graphing)

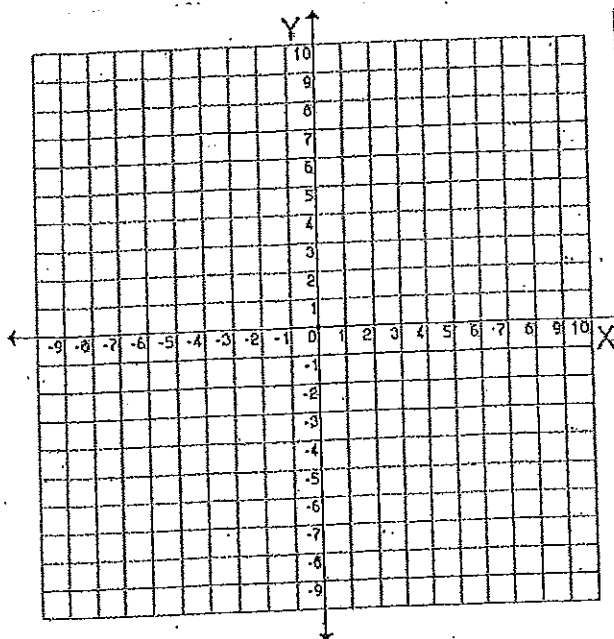
For each equation below:

- create a 3 or 4 column table with labels.
- use -1,0,1 for domain values unless you are given specific values to use for a specific problem.
- Graph the line- remember arrows and a label (the equation)
- Tell whether it is linear or non-linear.

1. $y = x^2 - 2$

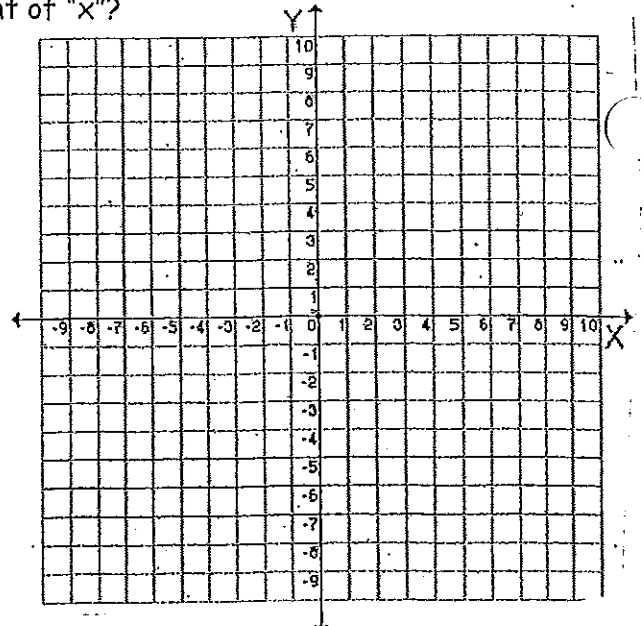


2. $y = 3x - 4$

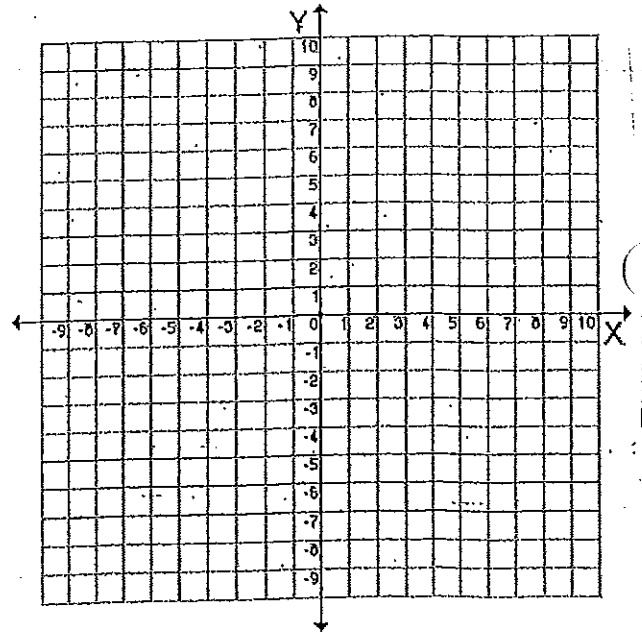


3. $y = x$

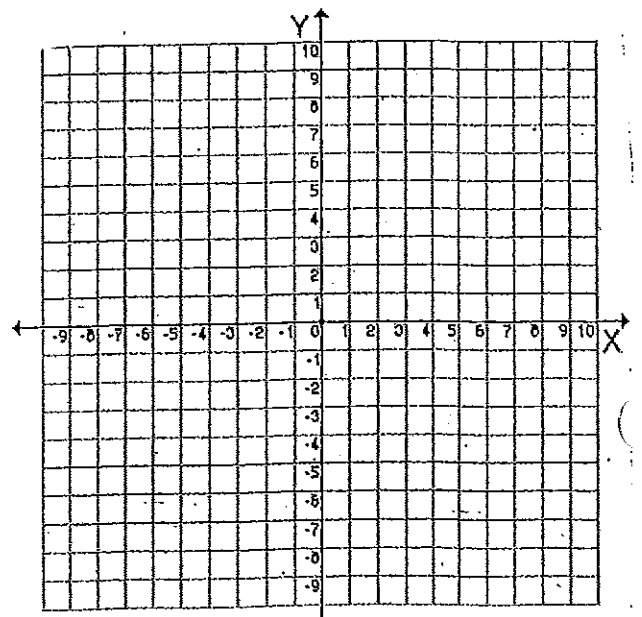
remember: what is the co-efficient in front of "x"?



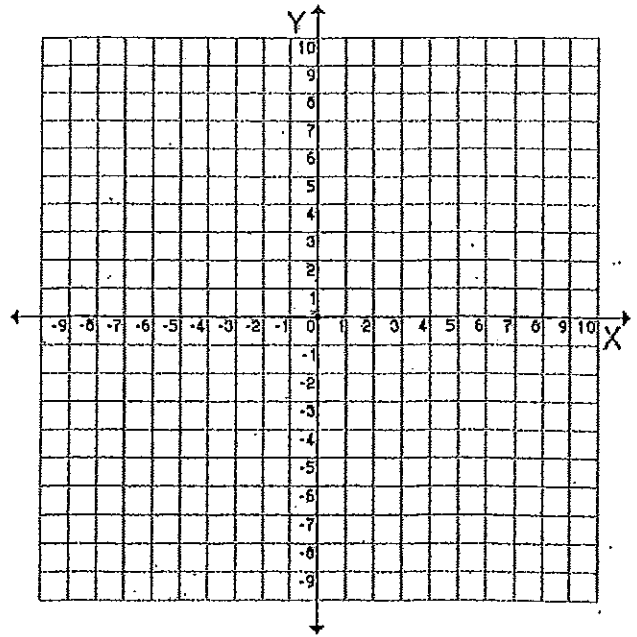
4. $y = (-x)^3$



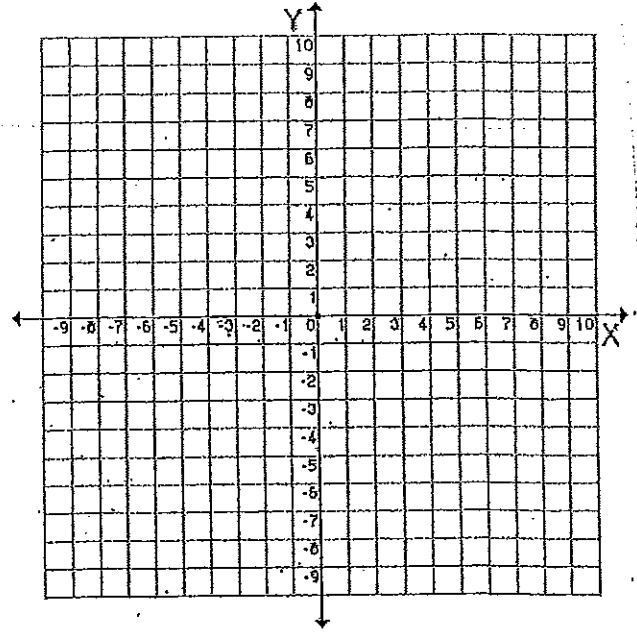
5. $y = 3x - 3$



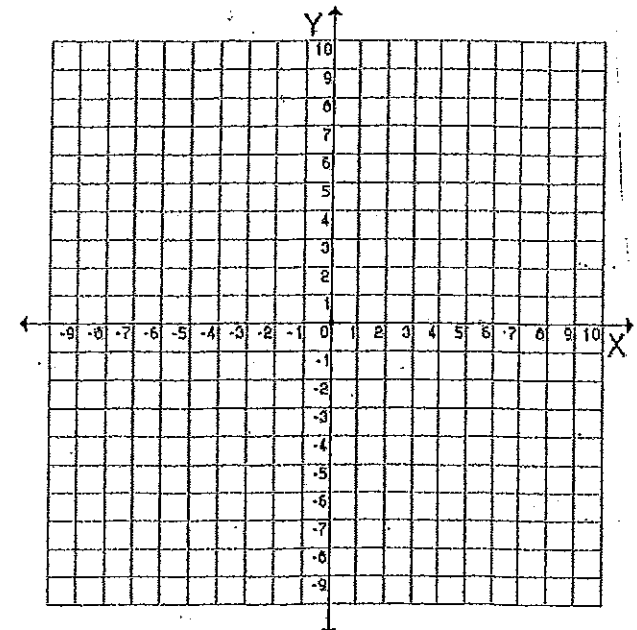
6. $y = 4x$



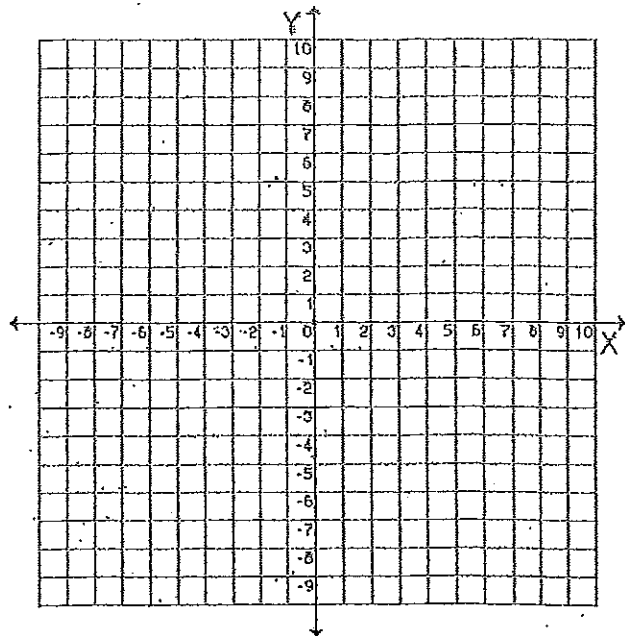
7. $y = 2x^2 - 3$



8. $y = \frac{1}{2}x$ use -2,0,4 for domain values

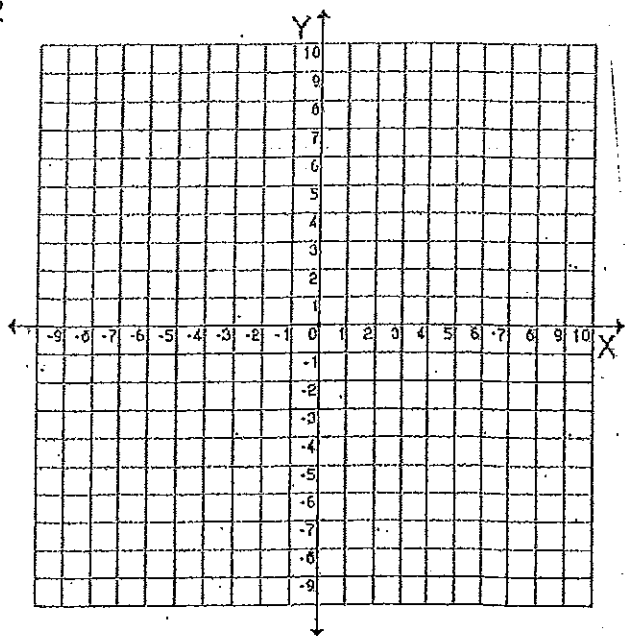


9. $y = (-x)^2 + 3$

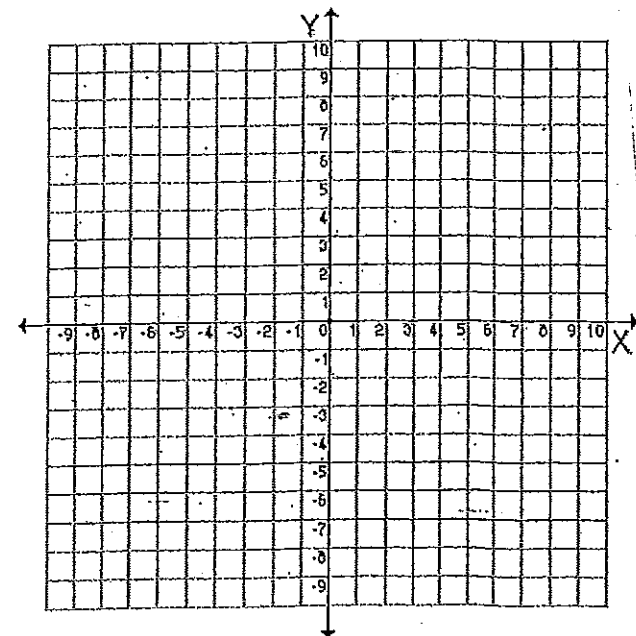


10. $y = \frac{1}{2}x + 6$

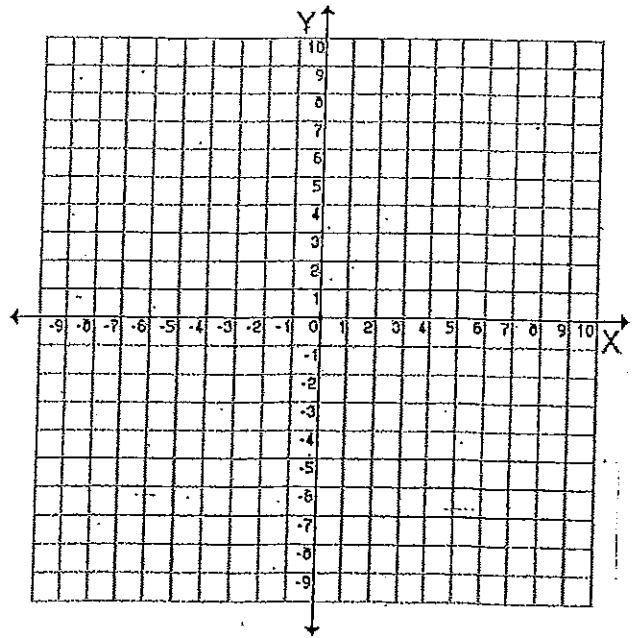
use domain values: -2, 0, 2



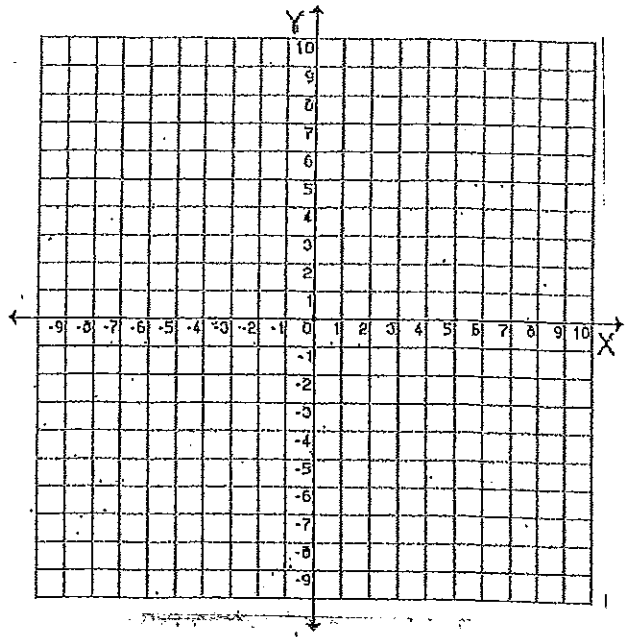
11. $y = 4x - 5$



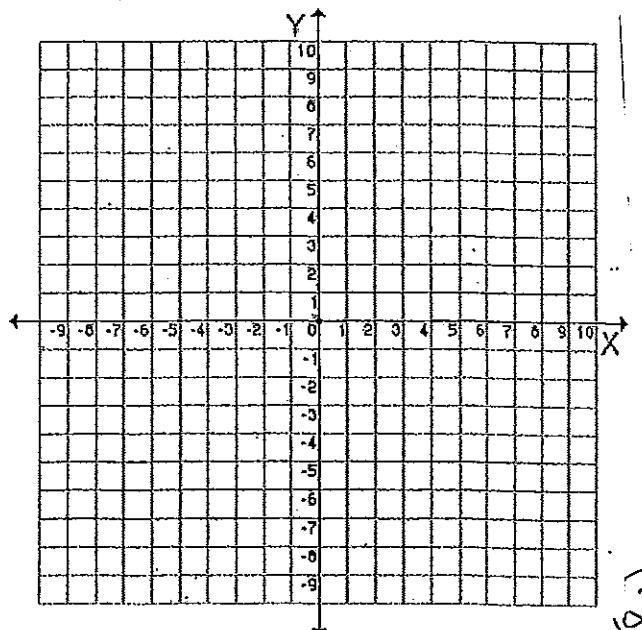
12. $y = -2x + 4$



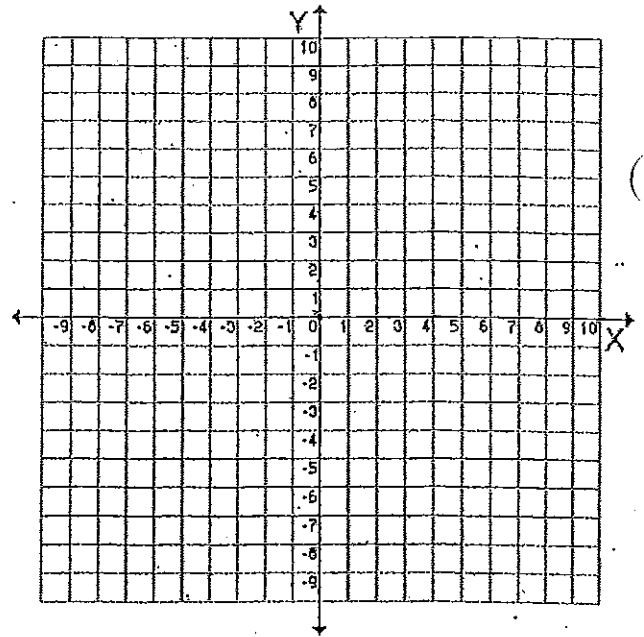
13. $y = x^3 - 6$



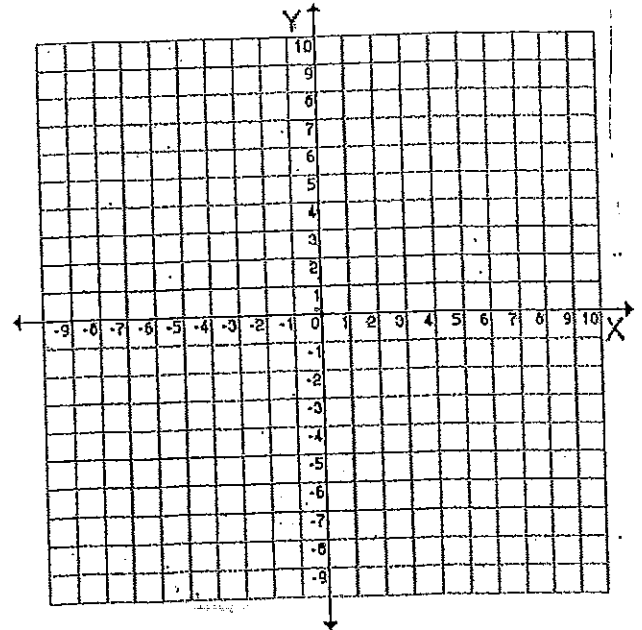
14. $y = 2x + 1$



15. $y = -3x + 1$



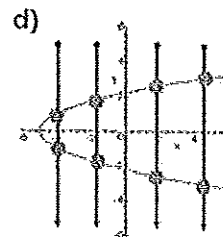
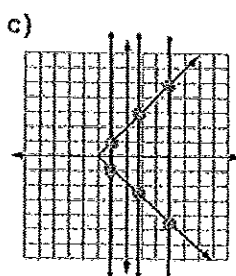
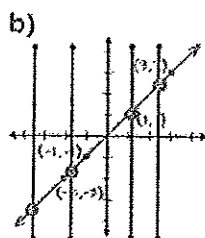
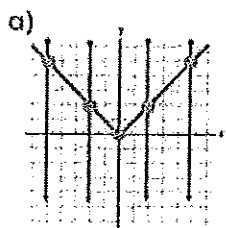
16. $y = 5x - 2$



Vertical Line Test:

- Sometimes we have to determine whether a relation is a function when it is presented in graph format.
- The vertical line test can be used to determine whether a relation is a function
- To use: draw vertical lines down through the graph. In order for the graph to be a function, only one point from the graph can go through any vertical line at one time.

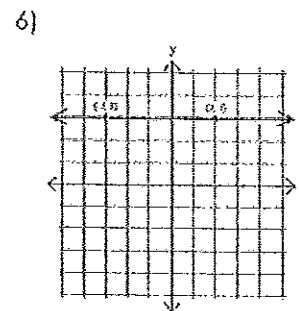
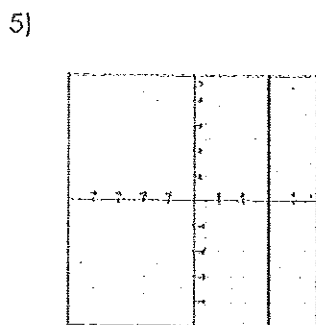
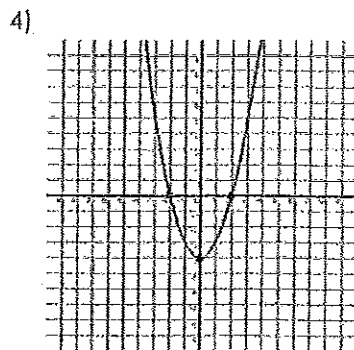
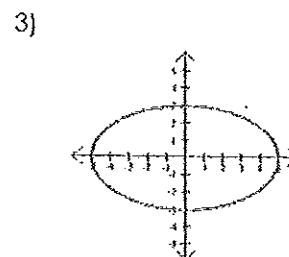
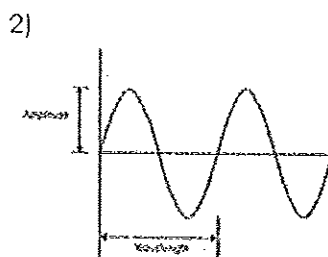
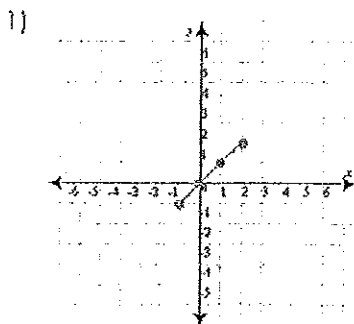
Examples:



Examples _____ and _____ are functions

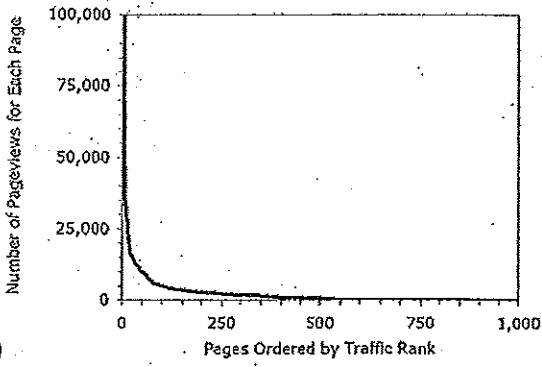
Examples _____ and _____ are NOT functions

Are these functions? Yes or No?
(use the vertical line test)

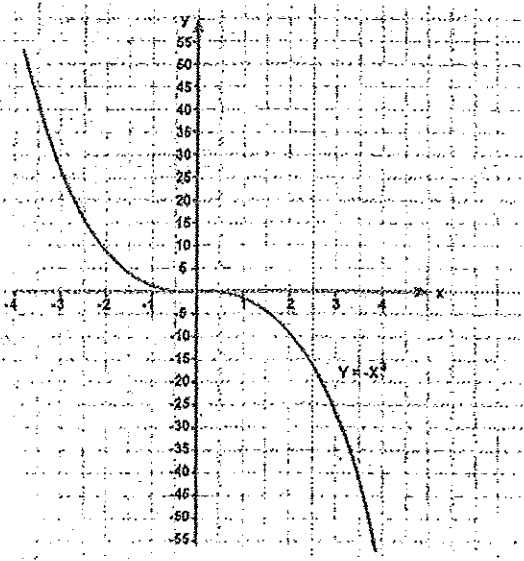


Vertical Line Test-HW

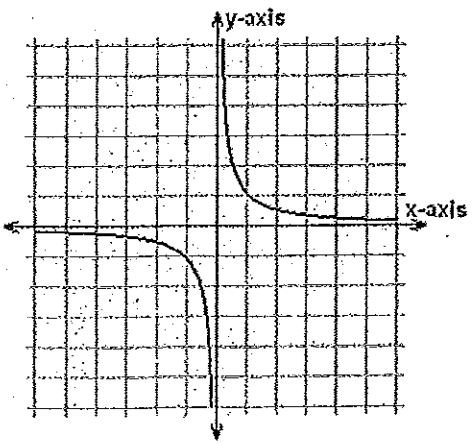
1)



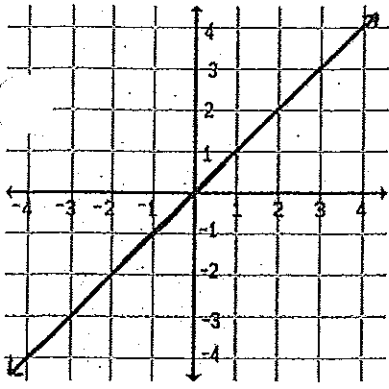
2)



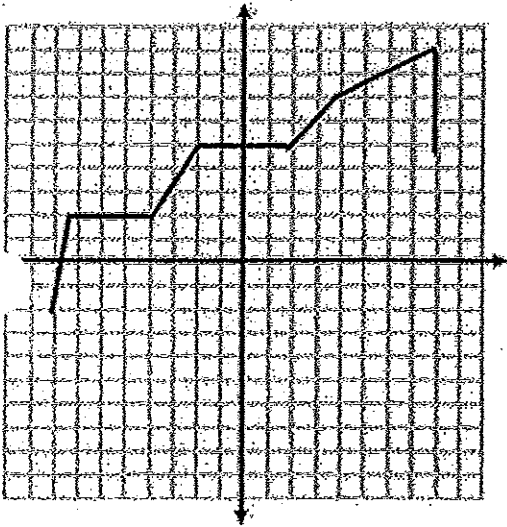
3)



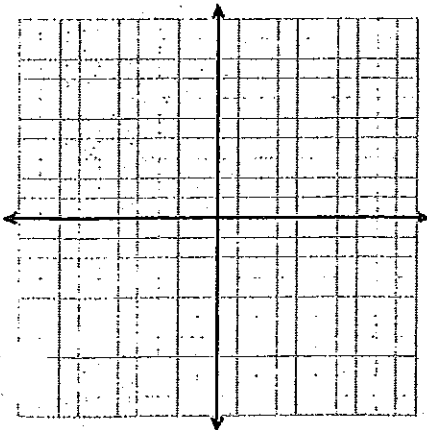
4)



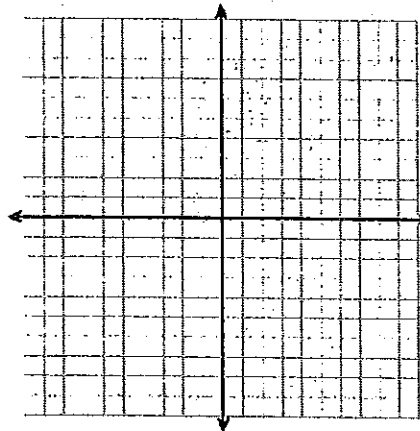
5)



6) Sketch an example of a relation that is a function:



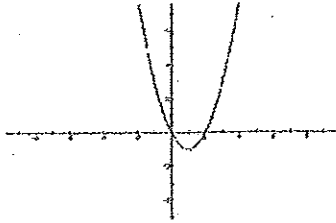
7) Sketch an example of a relation that IS NOT a function



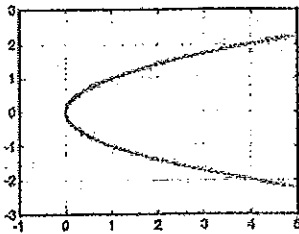
Vertical Line Test Homework

Determine if each image is a function by using the vertical line test

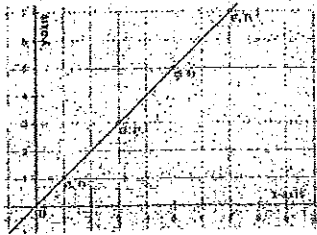
8.



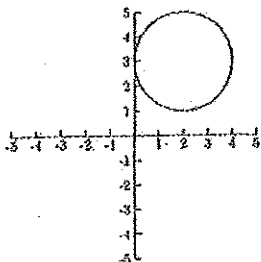
9.



10.

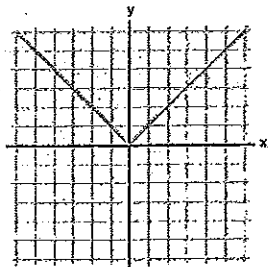


11.

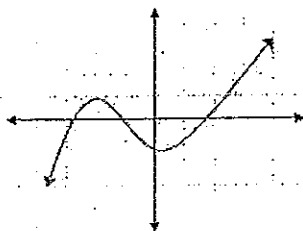


Determine if each image is a function by using the vertical line test

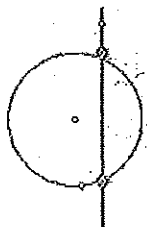
12.



13.



14.



15.

