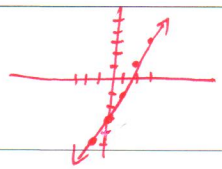
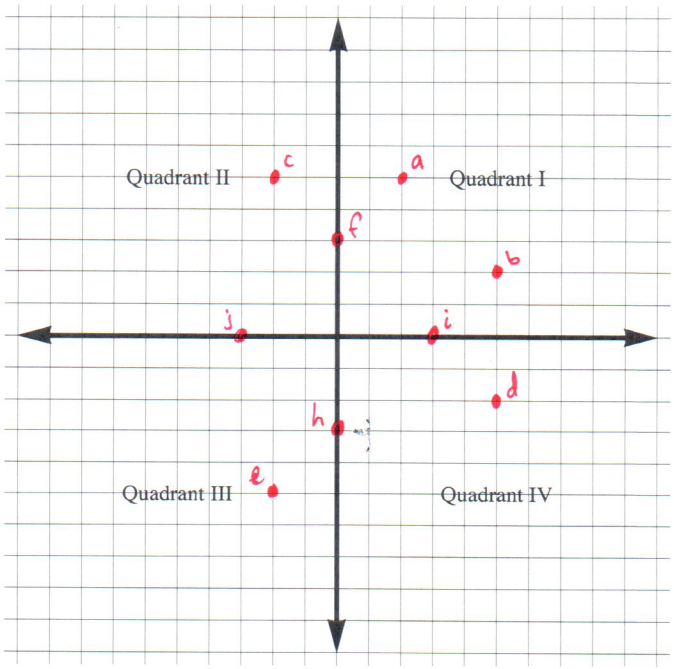
SECTION 2.2 FUNCTIONS AND THEIR GRAPHS

Name: Key **Date:** _____ **Period:** _____

Vocabulary

DEFINITION	EXAMPLE
Linear Function functions whose graphs are straight lines	$f(x) = 2x - 3$
Graph of a Function All of the ordered pairs (x, y) plotted on a Cartesian plane, where $y = f(x)$	



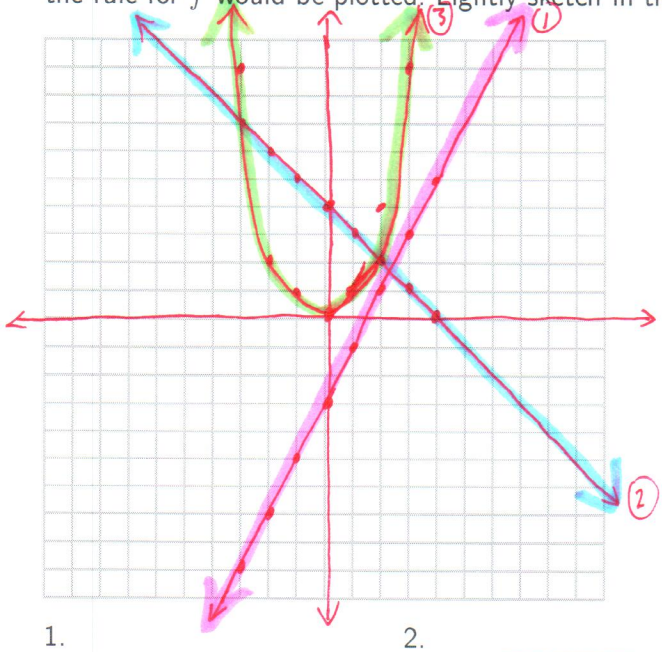
EXPLORATION 1

For each of the following points determine which Quadrant they are in. Then plot the ordered pairs on a coordinate plane.

a. $(2, 5)$ I
b. $(5, 2)$ I
c. $(-2, 5)$ II
d. $(5, -2)$ IV
e. $(-2, -5)$ III
f. $(0, 3)$ y-axis
h. $(0, -3)$ y-axis
i. $(3, 0)$ x-axis
j. $(-3, 0)$ x-axis

EXPLORATION 2

Make a table of 8 input-output pairs for each of the following functions. Plot these ordered pairs as points on a coordinate plane using graph paper. Guess how all the other points that satisfy the rule for f would be plotted. Lightly sketch in the rest of the graph of each function.



1.

x	$f(x) = 2x - 3$
-3	-9
-2	-7
-1	-5
0	-3
1	-1
2	1
3	3
4	5

2.

x	$f(x) = 4 - x$
-3	7
-2	6
-1	5
0	4
1	3
2	2
3	1
4	0

Answers will vary slightly.

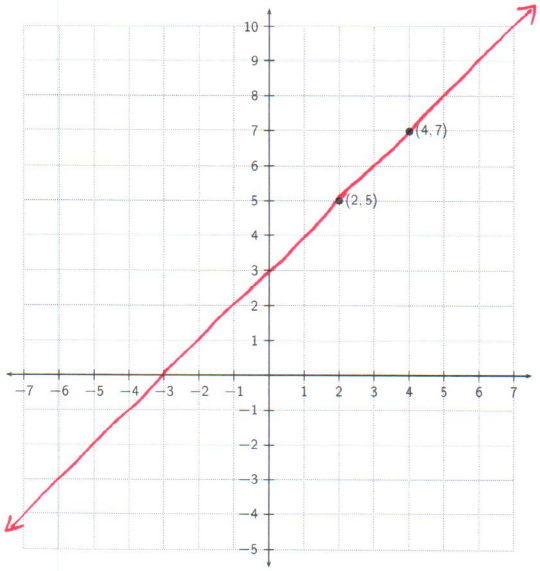
3.

x	$f(x) = x^2$
-3	9
-2	4
-1	1
0	0
1	1
2	4
3	9
4	16

Graph may be wrong at first.

EXAMPLE 1

What is the rule for the function with $f(2) = 5$ and $f(4) = 7$ which has a straight line as its graph?

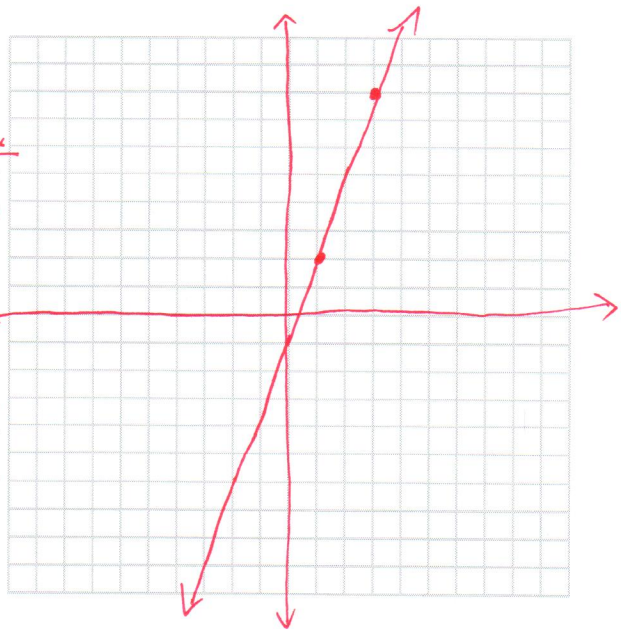


Input $= x$	Output $= f(x)$
-4	-1
-3	0
-2	1
-1	2
0	3
1	4
2	5
3	6
4	7
5	8
6	9
7	10
x	$x + 3$

EXAMPLE 2

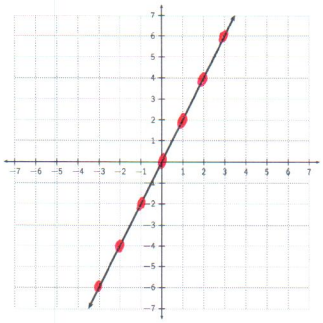
What is the formula of the function f that has the following input-output pairs and has a graph of a straight line?

Input $= x$	Output $= f(x) = y$	$3x$
-1	-4	-3
0	-1	0
1	2	3
2	5	6
3	8	9
~~3~~		
4	11	12
5	14	15
x	$f(x) = 3x - 1$	$3x$



PROBLEM 2

Consider the graph below of $y = f(x)$:



Answers will vary slightly.

x	$f(x)$
-3	-6
-2	-4
-1	-2
0	0
1	2
2	4
3	6
x	2x

1. Identify 5 points on this graph.

   (-3,-6); (-2,-4); (-1,-2); (0,0); (1,2); (2,4); (3,6)

2. How could the graph be changed to make it easier to locate your points?

   Answers will vary

3. How much does the output y change when the input x increases by 1?

   increases by 2

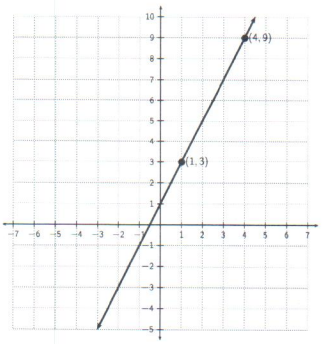
4. Using this fact, what is the rule or formula for the function?

   $f(x) = 2x$

EXAMPLE 3

Plot the two points $(1, 3)$ and $(4, 9)$ on a coordinate plane and draw a straight line through them. Identify other points on the graph. Can you find the rule of the function with this as its graph?

Solution



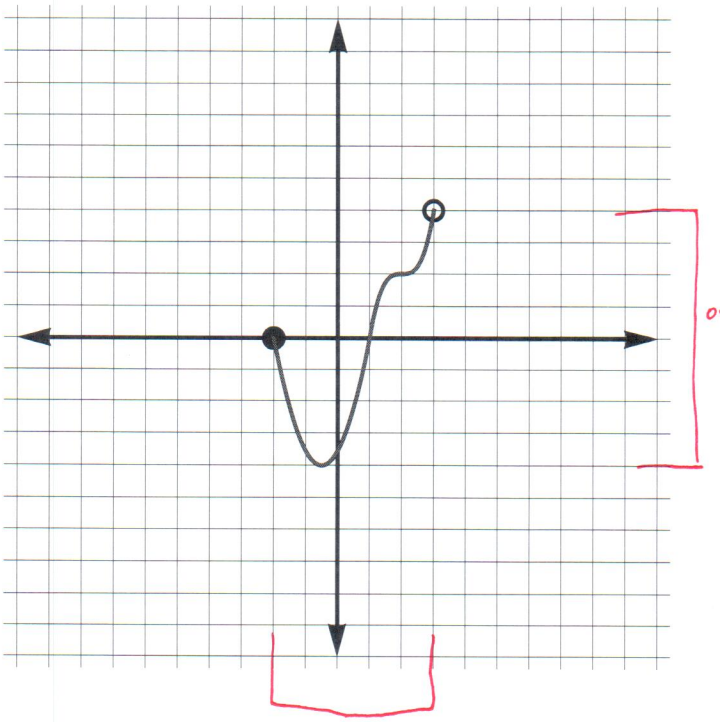
x	y	Pattern	Connection to input
0	1	1	1+2(0)
1	3	1+2	1+2(1)
2	5	1+2+2	1+2(2)
3	7	1+2+2+2	1+2(3)
4	9	1+2+2+2+2	1+2(4)

$f(x) = 2x + 1$

Domain and Range on the Graph

EXAMPLE 4

The graph of $f(x)$ is shown below. Use the graph to determine the domain and range of $f(x)$. Represent them using set notation.

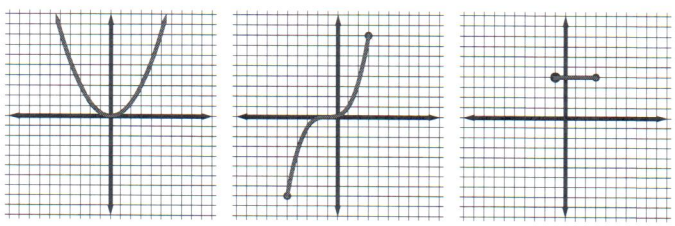


Domain: $\{x : -2 \leq x < 3\}$

Range: $\{y : -4 \leq x < 4\}$

PROBLEM 3

For each of the graphs use set notation to describe the domain and range.



D: all numbers
R: $\{y : y \geq 0\}$

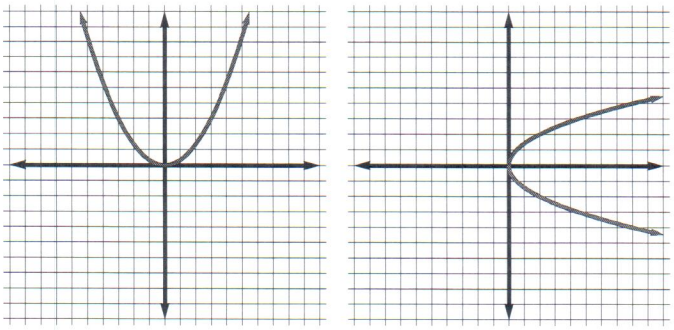
D: $\{x : -5 \leq x \leq 3\}$
R: $\{y : -8 \leq y \leq 8\}$

D: $\{x : -1 \leq x \leq 3\}$
R: $y = 4$

Is it a Function?

Not all graphs represent functions. In a function each input is only assigned to one output, but different inputs can be assigned to the same output. Now we explore what this means for the graph of a function.

EXPLORATION 3



Look at the two graphs above. One is a function and one is not.

1. For the graph on the left, when $x = 1$ what is the value of y? Is there more than one value of y assigned to $x = 1$? NO.

   when $x = 1$, $y \approx 1/4$ (or .25)

2. For the graph on the right, when $x = 1$ what is the value of y? Is there more than one value of y assigned to $x = 1$? yes.

   when $x = 1$, $y \approx 1.5$ OR -1.5

3. Make a table of 6 ordered pairs for each graph. Did you repeat any of the input values? Why is this important in determining if the graph represents a function?

   Answers will vary.

   Inputs may repeat for right graph.

   A function has only one output for each input.

SUMMARY (What I learned today)