INTRODUCTION TO FUNCTIONS

A function is any "rule" that assigns exactly one y-value (*RANGE*) for each x-value value (*DOMAIN*). These rules can be expressed in different ways, the most common being equations, graphs, and tables of values. We call the input variable **independent** and output variable **dependent**.

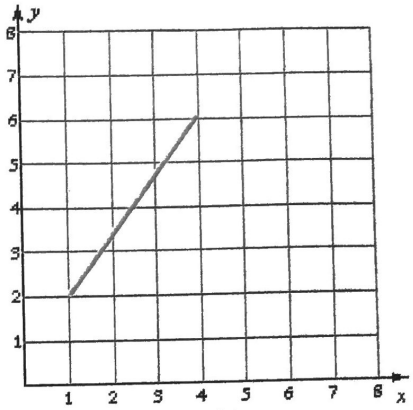
Find the domain and range:

x	3	4	5	6
y	1	2	2	3

D: { 3, 4, 5, 6 }

R: { 1, 2, 3 }

Find the domain and range:



D: $1 \leq x \leq 4$

R: $2 \leq y \leq 6$

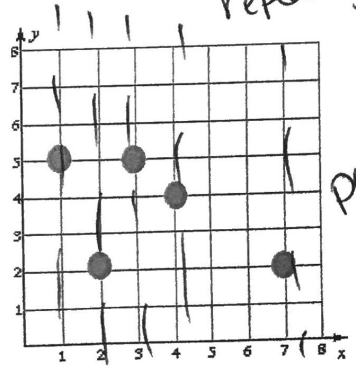
Examples of functions:

1.

x	2	3	4	5
y	3	4	4	6

repeating y's is okay.

2.



passes VLT

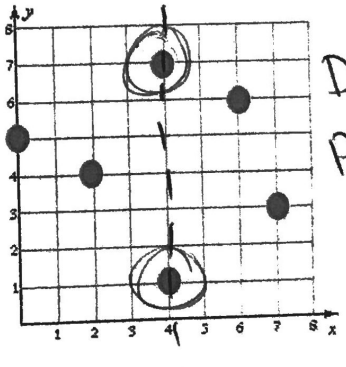
Examples of relations:

3.

x	5	6	6	7
y	1	2	3	4

repeating x's is not a function

4.



Does not pass VLT

How can you tell if something is a function?!

graph - passes the vertical line test

table - no repeating x-values

Indicate whether each is a function or not a function. Then give the domain and range.

1. $f(x) = \{(3, 5), (7, 4), (6, 4), (-3, 1), (-2, -2)\}$

   Function? yes Domain = $\{-3, -2, 3, 6, 7\}$ Range= $\{-2, 1, 4, 5\}$

2. $g(x) = \{(1, 3), (0, 9), (10, 12), (1, 15)\}$

   Function? no Domain = $\{0, 1, 10\}$ Range= $\{3, 9, 12, 15\}$

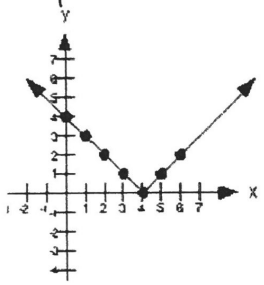
$y = mx + b$

3. $h(x) = 3x - 7$

   Function? yes Domain = $(-\infty, \infty)$ or $\mathbb{R}$ Range= $(-\infty, \infty)$ or $\mathbb{R}$

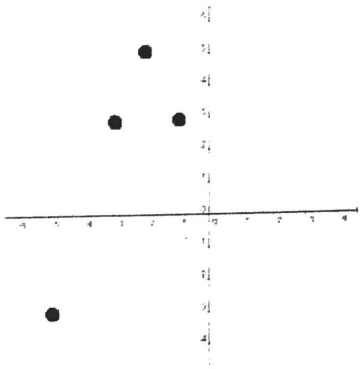
   all real #s

4. $m(x) =$



   Function? yes Domain = $(-\infty, \infty)$ or $\mathbb{R}$ Range= $[0, \infty)$

5. $r(x) =$



   Function? yes Domain = $\{-5, -3, -2, -1\}$ Range= $\{-3, 3, 5\}$

Use the definitions in problems 1-5 to find these values:

6. $f(6) =$ 4 (x: 6, y: 4)

7. $g(1) =$ 3, 15 (x: 1, y: 3, 15)

8. $h(5) =$ 8 (x: 5, y: 8)

   $3(5) - 7$

9. $h(a) =$ $3(a) - 7$

10. $m(5) =$ 1 (x: 5, y: 1)

11. $r(-1) =$ 3 (x: -1, y: 3)

12. $2g(0) - 4m(1) =$ 6

    $2 \cdot 9 - 4 \cdot 3 = 18 - 12$

13. If $f(x) = 4$, then $x =$ 6

    output ↑ input ↑

14. If $m(x) = 2$, then $x =$ 2, 6

Function Notation & Evaluating a Function

When the value of x is 5, $f(5)$ (read "f of 5") represents the value of the function at $x = 5$.

What *is* $f(x)$? AKA "y"

Answer: It is the _____ from the function f when the _____ is x.

What *is* $g(t)$? AKA "y"

Answer: It is the output from the function _____ when the input is _____.

Note that f and $f(x)$ are *different*:

- f is the name of the function (the "rule").
- $f(x)$ is the *output* from this rule when the input is x.

If $f(x) = 3x - 2$, then $f(5) = 3(5) - 2 =$ 13

15 - 2

INPUT:

x = _____

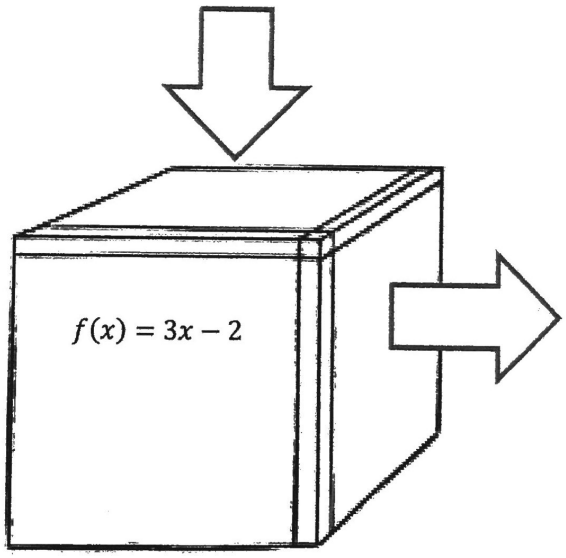
Function Rule:

Input Value	*Output Value*
x	$f(x)$
5	13
-4	-14
3	7
10	28

$3(-4) - 2 =$

$3x - 2 = 7$
$+2 \quad +2$
$\frac{3x}{3} = \frac{9}{3}$
$x = 3$

$3x - 2 = 28$
$+2 \quad +2$
$\frac{3x}{3} = \frac{30}{3}$
$x = 10$



OUTPUT:

$f(x) =$ ___

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

Evaluate. Don't forget when you evaluate a function **you must use parenthesis** around the input when you sub it in!

A. $f(2)$

$(2)^2 + 2(2) - 3$
$4 + 8 - 3$
9

B. $f(-2)$.

$(-2)^2 + 2(-2) - 3$
$4 - 4 - 3$
-3

Ex 3: $f(x) = -2(x) + 4$. Find:

A. $f(-7)$	B. $f(a)$	C. $f(a+2)$
$-2(-7)+4$ $14+4$ 18	$-2(a)+4$ $-2a+4$	$-2(a+2)+4$ $-2a-4+4$ $-2a$

Let's Practice!

1.

x	f(x) = -4x -10
0	-10
6	-34
2	-18
-5	10

$-4(0)-10$
$-4(6)-10$

$-4x-10=-18$
$+10 \quad +10$
$\frac{-4x}{-4} = \frac{-8}{-4} = 2$

$-4x-10=10$
$+10 \quad +10$
$\frac{-4x}{-4} = \frac{20}{-4} = -5$

2.

x	f(x) = x^2 + 5
7	54
-5	30
10	105
6	41

$(7)^2+5$
$(-5)^2+5$

$x^2+5=41$
$-5 \quad -5$
$x^2=36$
$x=6$

$x^2+5=105$
$-5 \quad -5$
$x^2=100$
$x=10$

Try This! Can you figure out the pattern to determine f(x)???

3.

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

4.

x	f(x) = x^2 - 10
-3	-1
0	-10
4	6
10	90

Real Life-Application

Suppose Verizon Phone Company has a phone plan that consists of an activation fee of $25 and a monthly rate of $80/month.

x	f(x) =

a) Write the function in the table as f(x).

b) Choose 4 inputs that make sense to this situation.

c) Now calculate the outputs to complete the table.

d) Did you choose any negative x values? Why or why not?

e) Would decimals make sense as input values in this situation?