

### Math Analysis

#### 1.2 Basics of Functions and Their Graphs

Relation - a pairing of elements of one set with elements of a 2nd set

Many representations: ordered pairs, table of values, graphs, equations

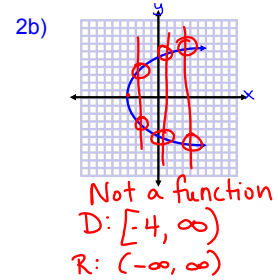
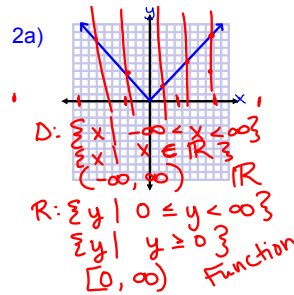
Domain - the set of all x coordinates

Range - the set of all y coordinates

A function is a special type of relation. It is a relation in which each element of the domain is paired with exactly one element in the range. A relation that passes the Vertical Line Test is a function.

Ex) State the domain and range of each relation. Then state whether the relation is a function.

- 1a)  $\{(4,-2), (4,2), (9,-3), (-9,3)\}$   
 $D: \{4, 9, -9\}$   $R: \{-2, 2, -3, 3\}$   
 Not a function
- 1b)  $\{(1,6), (2,6), (3,8), (4,9)\}$   
 $D: \{1, 2, 3, 4\}$   
 $R: \{6, 8, 9\}$  Function



#### Functions as Equations

Solve the equation for y. If two or more values of y can be obtained for a given x, the equation is **not** a function.

Determine whether each equation defines y as a function of x:

a)  $x^2 + y = 4$   
 $-x^2 \quad \boxed{x = \text{Function}}$   
 $y = -x^2 + 4$   
 $-(2)^2 + 4$   
 $-4 + 4$   
 $0$

b)  $x^2 + y^2 = 4$   
 $-x^2 \quad \boxed{-x^2}$   
 $\sqrt{y^2} = \sqrt{-x^2 + 4}$   
 $y = \pm \sqrt{-x^2 + 4}$   
 Not a function

#### Function Notation & Evaluating Functions

$f(x) = y$

①  $f(-4)$   $f(x) = 3x^3 - 7x^2 - 2x$   
 $f(-4) = 3(-4)^3 - 7(-4)^2 - 2(-4)$   
 $f(-4) = 3 \cdot -64 - 7 \cdot 16 + 8$   
 $-192 - 112 + 8$   
 $f(-4) = -296$   $(-4, -296)$

②  $g(x+3)$   $g(x) = x^2 + 3x + 5$   
 $g(x+3) = (x+3)^2 + 3(x+3) + 5$   
 $(x+3)(x+3) + 3x + 9 + 5$   
 $x^2 + 6x + 9 + 3x + 9 + 5$   
 $g(x+3) = x^2 + 9x + 23$

③ Use  $g(x)$  from ②  
 $g(-x) = (-x)^2 + 3(-x) + 5$   
 $g(-x) = x^2 - 3x + 5$

Try this:

$$f(2b+3) \quad f(x) = x^2 - 2x + 1$$

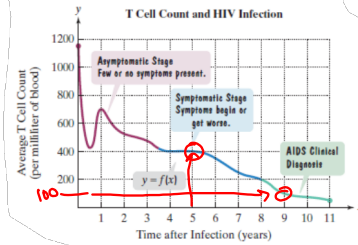
$$f(2b+3) = (2b+3)^2 - 2(2b+3) + 1$$

$$= (2b+3)(2b+3) - 4b - 6 + 1$$

$$= 4b^2 + 12b + 9 - 4b - 6 + 1$$

$$f(2b+3) = 4b^2 + 8b + 4$$

Use the graph to find  $f(5) = 400$



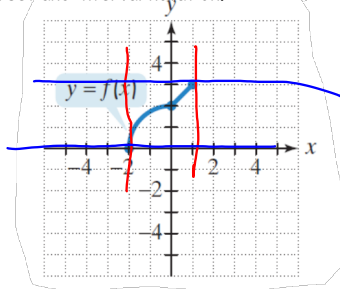
For what value of  $x$  is  $f(x) = 100$ ?

$x = 9$

Use the graph of the function to identify its domain and its range. Put answers in set and interval notation.

D:  $\{x \mid -2 \leq x \leq 1\}$   
 $[-2, 1]$

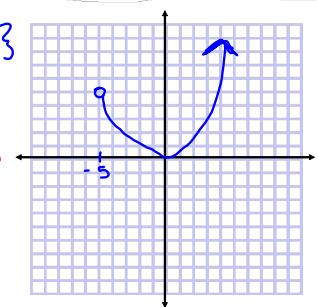
R:  $\{y \mid 0 \leq y \leq 3\}$   
 $[0, 3]$

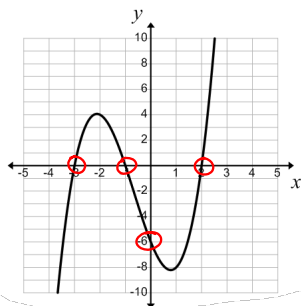


Use the graph of the function to identify its domain and its range. Put answers in set and interval notation.

D:  $\{x \mid -5 < x < \infty\}$   
 $(-5, \infty)$

R:  $\{y \mid 0 \leq y < \infty\}$   
 $[0, \infty)$



**Identifying Intercepts from a Function's Graph**Identify the  $x$ - and  $y$ -intercepts for the graph of  $f(x)$ .

zeros  
X-int:  $-3, -1, 2$   
y-int:  $-6$

# Homework

pg 168: 4,6,10,14,18,20,24,32,34,38,56-64e,74-90e  
ec: 96,98