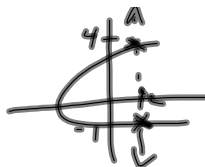


Functions



What is a function?

A function is a rule that assigns to each element in a set A exactly one element, called $f(x)$.

How do we identify the domain and range of a function?

- First must know what these terms mean...define each.
- Must know how to indicate domain and range using correct notation (Set and Bracket)

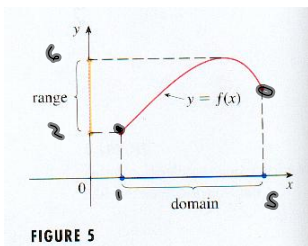


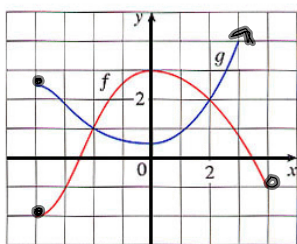
FIGURE 5

Domain: $\{x \mid 1 \leq x < 5, x \in \mathbb{R}\}$
 Includes \rightarrow $[1, 5)$ \leftarrow Up to... But NOT including
 Smallest largest

Range: $\{y \mid 2 \leq y \leq 6, y \in \mathbb{R}\}$
 $[2, 6]$

ex. $x \geq 3$ $(3, \infty)$ $x \leq 2$ $(-\infty, 2)$
 $x \in \mathbb{R} \Rightarrow (-\infty, \infty)$ OR $x \in \mathbb{R}, x \neq 3$ $(-\infty, 3) \cup (3, \infty)$

Examples:

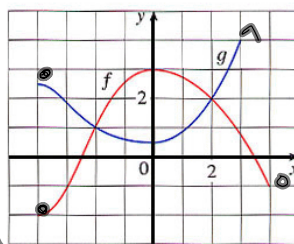


"f":

D: $[-4, 4)$
 $-4 \leq x < 4$

R: $[-2, 3]$

$-2 \leq y \leq 3$



"g":

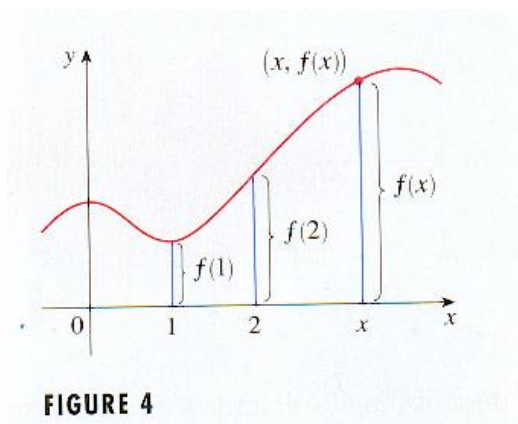
D: $[-4, \infty) \Rightarrow x \geq -4$

R: $[\frac{1}{2}, \infty) \Rightarrow y \geq \frac{1}{2}$

Function Notation

- Must understand the notation associated with determining the values of functions

I. From a graph



II. From a table of values

$$f(2) = 7$$

x	$f(x)$
2	7

III. From an explicit formula (Equation)

$$f(x) = -2x^2 + 5x - 3 \quad \longleftarrow \text{Explicit formula!}$$

$$f(-3) = ?$$

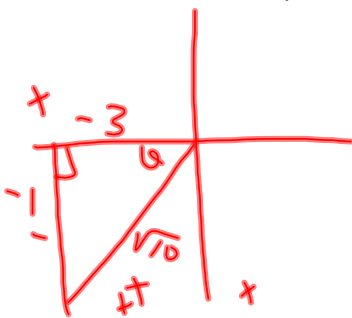
$$f(8) = ?$$

$$f(2 - h) = ?$$

$$\begin{aligned} f(2-h) &= -2(2-h)^2 + 5(2-h) - 3 \\ &= -2(4 - 4h + h^2) + 10 - 5h - 3 \\ &= -8 + 8h - 2h^2 + 10 - 5h - 3 \\ &= -2h^2 + 3h - 1 \end{aligned}$$

Check-Up # 2

1. If $\sin \theta = -\frac{1}{\sqrt{10}}$ and $\cos \theta < 0$ find $\tan \theta$



$$\tan \theta = \frac{1}{3}$$

2. Determine the domain and range of the quadratic $f(x) = -5x^2 + 10x - 3$.

$$f(x) = -5(x^2 - 2x + 1) - 3 + 5$$



$$= -5(x-1)^2 + 2$$

$V(1, 2)$ opens down

$$D: x \in \mathbb{R}$$

$$R: (-\infty, 2]$$

$$y \leq 2$$

Warm Up

Select the best response for each of the following:

1. Find the domain of $f(x) = \sqrt{2x+3}$.

- a) $[0, \infty)$ b) $(0, \infty)$ c) $[-\frac{3}{2}, \infty)$
 d) $(-\frac{3}{2}, \infty)$ e) $[0, \frac{3}{2})$

$2x+3 \geq 0$
 $2x \geq -3$
 $x \geq -\frac{3}{2}$

2. Find the range of the function $y = \frac{1}{x-3}$.

- a) $(3, \infty)$ b) $(-\infty, 3)$
 c) $(-\infty, \frac{1}{3}) \cup (\frac{1}{3}, \infty)$ d) $(-\infty, 3), (3, \infty)$
 e) $(-\infty, 0), (0, \infty)$

3. If $f(x) = 2x^3 + Ax^2 + Bx - 5$ and if $f(2) = 3$ and $f(-2) = -37$, what is the value of $A + B$?

- (A) -6 (B) -3 (C) -1 (D) 2
 (E) It cannot be determined from the information given.

$3 = 16 + 4A + 2B - 5$
 $4A + 2B = -8$

$-37 = -16 + 4A - 2B - 5$
 $4A - 2B = -16$

$4A + 2B = -8$
 $4A - 2B = -16$

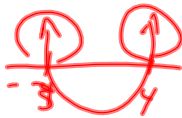
 $8A = -24$
 $A = -3$

4. Solve: $x^2 - x > 12$

- a) $x < -6$ or $x > 1$ b) $x < -3$ or $x > 4$
 c) $x < -2$ or $x > 3$ d) $-6 < x < 1$
 e) $-2 < x < 3$

$x^2 - x - 12 > 0$
 $(x-4)(x+3) > 0$
 $x = 4, -3$

$-12 + 2B = -8$
 $2B = 4$
 $B = 2$



$x < -3$ or $x > 4$

$(-\infty, -3) \cup (4, \infty)$



$f(x) = \frac{1}{x-3} \quad x \neq 3$

Domain: $x \in \mathbb{R}, x \neq 3$ $(-\infty, 0) \cup (0, \infty)$
 $(-\infty, 3) \cup (3, \infty)$