KEY

Notes 1.2 – Basics of Functions and Their Graphs

Relation: any set of ordered pairs

Function: correspondence from domain to range such that each element in the domain corresponds to exactly one element in the range

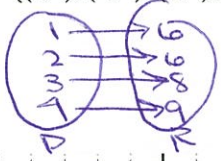
Domain: set of all first components of the ordered pairs

Range: set of all second components of the ordered pairs

Vertical Line Test: If any vertical line intersects a graph in more than one point, the graph does not define y as a function of x

Example: Determine whether each relation is a function. State the domain and range.

1. $\{(1,6),(2,6),(3,8),(4,9)\}$

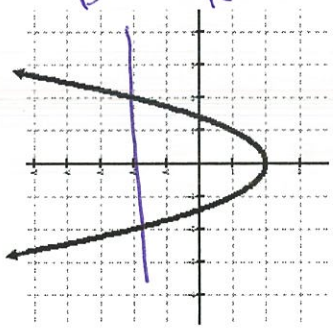


FUNCTION

2. $\{(6,1),(6,2),(8,3),(9,4)\}$

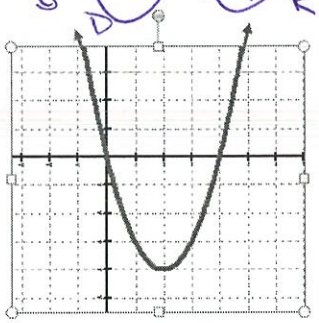
NOT FUNCTION

3.



NOT

4.



FUNCTION

Function Notation: Any letter can be used to name a function

x input

$f(x)$ output

$f(x) = 0.013x^2 - 0.21x + 8.7$ Equation

Ex: Evaluate

1. $f(x) = x^2 - 2x + 7$

a. $f(-5)$

$f(-5) = 25 + 10 + 7$
$= 42$

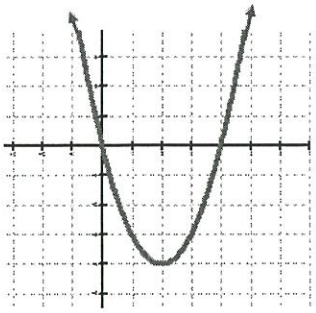
b. $f(x+4)$

$f(x+4) = (x+4)^2 - 2(x+4) + 7$
$= x^2 + 8x + 16 - 2x - 8 + 7$
$= x^2 + 6x + 15$

c. $f(-x)$

$f(-x) = (-x)^2 - 2(-x) + 7$
$= x^2 + 2x + 7$

Analyzing the Graph of a Function:



Example: $f(x) = x^2 - 4x$

a. Is this a function? Yes

b. Find $f(4)$ $= 16 - 16 = 0$

c. For what value of x is $f(x) = -4$

$x^2 - 4x = -4$
$x^2 - 4x + 4 = 0$
$(x-2)(x-2) = 0$

$x = 2$

Example: A company manufactures dog beds. They have a fixed cost of \$25,000 and it costs \$75/bed. Write an equation of total costs then interpret $c(50)$

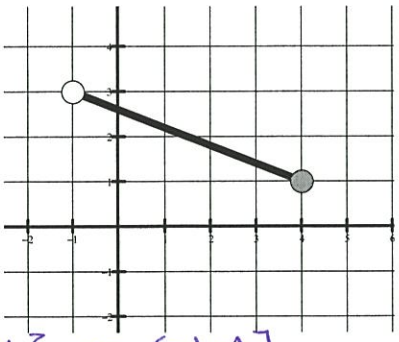
$c(x) = 25{,}000 + 75x$ $\quad c(50) = 25000 + 75(50)$
$= \$28{,}750$

Identifying Domain and Range:

Set-Builder Notation	Interval Notation
$\{x \mid -4 \le x \le 2\}$	$[-4,2]$
$\{x \mid 1 < x \le 5\}$	$(1,5]$

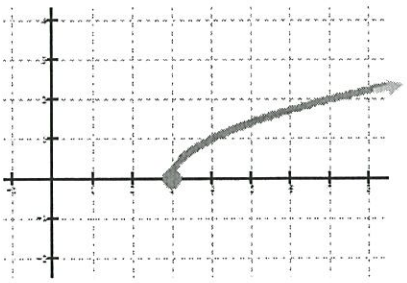
Example: Identify the Domain and Range of a Function from its Graph

1.



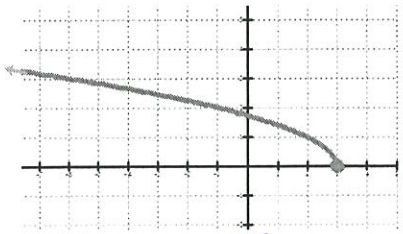
D: $\{x \mid -1 < x \le 4\}$ or $(-1,4]$
R: $\{y \mid 1 \le y < 3\}$ or $[1,3)$

2.



D: $\{x \mid x \ge 3\}$ or $[3,\infty)$
R: $\{y \mid y \ge 0\}$ or $[0,\infty)$

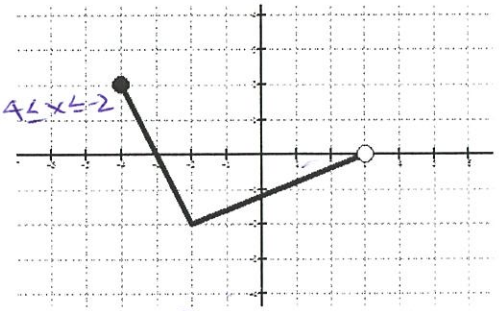
3.



D: $\{x \mid x \le 3\}$ or $(-\infty,3]$
R: $\{y \mid y \ge 0\}$ or $[0,\infty)$

4.

$f(x) = \begin{cases} 2x+6 ; -4 \le x \le -2 \\ \end{cases}$



D: $\{x \mid -4 \le x \le 3\}$ or $[-4,3]$
R: $\{y \mid -2 \le y \le 2\}$ or $[-2,2]$
R: $[-2,0) \cup (0,2]$