Name:	Date:	Period:

2.1 Relations & Functions Notes

Relations

- A set of **ordered pairs** can be show in a table, graph, mapping, or expressed as an equation.
- The set of x-values (inputs) is called the independent variable Domain and the set of y-values (outputs) is called the Range. dependent variable
- A relation with distinct points is called discrete and a relation with connected lines or curves is called continuous.

we will not focus on mapping representations

Function

Definition: A relation that each element of the Domain is paired with only one element of the Range.

For 1 x value, it can not have two different y values.

Function:

$\{(-1,0),(-5,2),(6,2),(5,7)\}$

one input has two or more different outputs

D: $\{-5,-1,5,6\}$
R: $\{0,2,7\}$

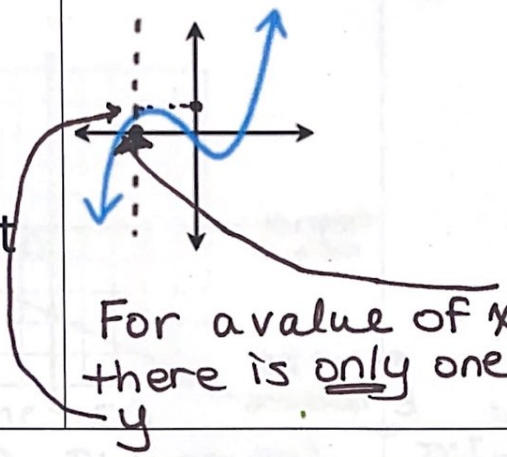
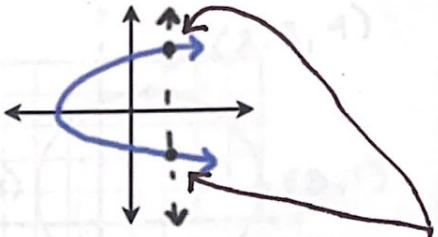
Not a Function:

X	y
-2 →	5
0	-3
-2 →	4
1	3

The same input, -2, has two different outputs 5 and 4

D: $\{-2,0,1\}$
R: $\{-3,3,4,5\}$

Domain & Range
- List least to greatest
- If number appears more than once, only list once.

Vertical Line Test	Function:	Not a Function:
	 For a value of x there is only one y	 For a value of x there are two values of y.

Directions: Find the domain and range of each relation. Then, determine if the relation is a function.

Ex1: $\{(-1,-9),(0,-5),(4,3),(6,-2)\}$

Function

D: $\{-1, 0, 4, 6\}$

R: $\{-9, -5, -2, 3\}$

Ex2: $\{(5,2),(-3,4),(5,-6),(8,0)\}$

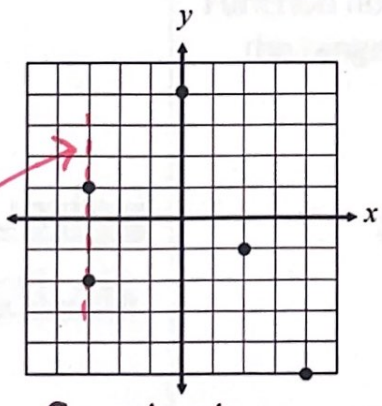
Not a function

$x = 5$ there are $y = 2, -6$

D: $\{-3, 5, 8\}$ only list # once

R: $\{-6, 0, 2, 4\}$

Ex3:



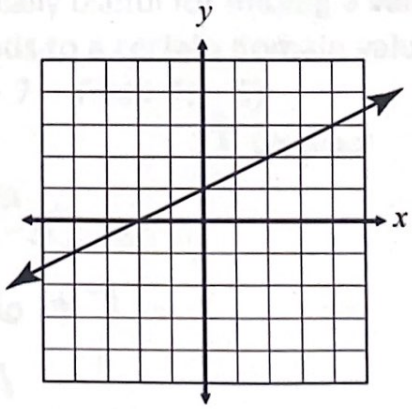
At $x = -3$, $y = -2, 1$

Not a function

D: $\{-3, 0, 2, 4\}$

R: $\{-5, -2, -1, 1, 4\}$

Ex4:

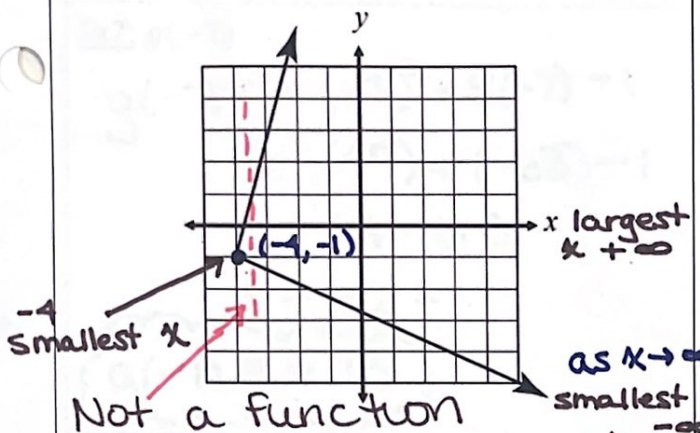


Function

D: $(-\infty, \infty)$

R: $(-\infty, \infty)$

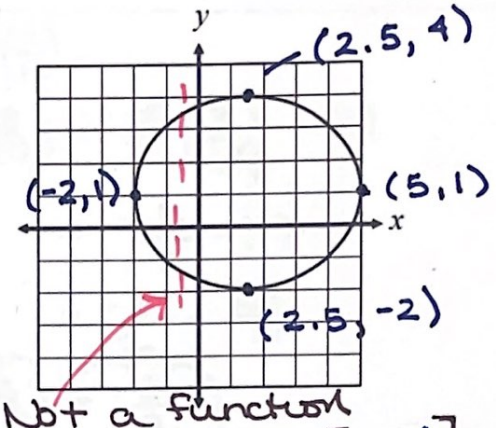
Ex5:



Not a function

D: $[-1, \infty)$ R: $(-\infty, \infty)$

Ex6:



Not a function

D: $[-2, 5]$ Range: $[-2, 4]$

Function Notation

Equations that represent functions are often write in **function notation**.

Example of an equation that is a function.

$y = 2x + 7 \rightarrow f(x) = 2x + 7$

input

$f(x)$

output → y

x is the **input** and f(x) is the **output**.

Evaluating Functions

Function notation is specifically useful for finding a value in the range that corresponds to a certain domain value.

$f(x) = 2x + 7 \quad Find\ f(-3)$

↑ input

$f(-3) = 2(-3) + 7$

$= -6 + 7$

$f(-3) = 1$

when $x = -3$ $y = 1$

input output

put ( ) around your input

If $f(x) = -5x - 14$ and $g(x) = -x^2 + 9x - 1$ find the following.

Ex7: $g(-7)$

$g(-7) = -(-7)^2 + 9(-7) - 1$

$= -(49) + (-63) - 1$

$= -49 - 63 - 1$

$= -112 - 1$

$g(-7) = -113$

Ex8: $f\left(\frac{3}{10}\right)$

$f\left(\frac{3}{10}\right) = -5\left(\frac{3}{10}\right) - 14$

$= -\frac{3}{2} - 14$

$= -\frac{3}{2} - \frac{28}{2}$

$f\left(\frac{3}{10}\right) = -\frac{31}{2}$

Ex9: $f(1) - f(-4)$

$-5(1) - 14 - [-5(-4) - 14]$

$f(1) - f(-4)$

$-5 - 14 - (20 - 14)$

$-5 - 14 - 20 + 14$

$-19 - 20 + 14$

$-39 + 14$

-25

Ex10: $2[g(12)]$

$2(-(12)^2 + 9(12) - 1)$

$2(-144 + 108 - 1)$

$2(-36 - 1)$

$2(-37)$

-74

If $f(x) = 3x + 19$ find the following.

Ex11: If $f(x) = 34$, find x.

y

$34 = 3x + 19$

$-19 \qquad -19$

$15 = 3x$

$x = 5$

Ex12: If $f(x) = -62$, find x.

$-62 = 3x + 19$

$-81 = 3x$

$-27 = x$

If $f(x) = -4x + 9$ and $g(x) = x^2 - 5$ find the following.

Ex12: $f(c+2)$

x

$f(c+2) = -4(c+2) + 9$

$= -4c - 8 + 9$

$f(c+2) = -4c + 1$

Ex13: $g(a-3)$

$g(a-3) = (a-3)^2 - 5$

$= (a-3)(a-3) - 5$

$= a^2 - 6a + 9 - 5$

$g(a-3) = a^2 - 6a + 4$

Ex14: $f(2m+1) - f(3m-7)$

$-4(2m+1) + 9 - [-4(3m-7) + 9]$

$-8m - 4 + 9 - [-12m + 28 + 9]$

$-8m + 5 - (-12m + 37)$

$-8m + 5 + 12m - 37)$

$4m - 32$