CHAPTER 3: 3.2 Relations and Functions.

Relationships can be represented by a set of ordered pairs (x, y), called a **relation**. You can also show relations in other ways, such as tables, graphs, or mapping diagrams. Also shown as an equation.

Domain is the set of values used for the input (x-values). Independent Variable

Range is the set of values used for the output (y-values). Dependent Variable

Ex) (1,2), (2,3) (3,4) Function

A **function** is a special type of relation that pairs each domain value with exactly one range value.

A function can be described using function notation. The notation $f(x)$ is read as "f of x" (It does not indicate the product "f times x"). **F(X) means y.** other function Notations: g(x), h(x) .....

Ex) (1, 2), (2, 2) (3, 4) Function

Functions are often used to describe a relationship between two variables.

The ***independent variable*** represents an input value of the function x-value ; Domain

The ***dependent variable*** represents an output value of the function y-value ; Range

Ex) (1,2), (1,4) (3,2) Not a Function

The **Vertical-Line Test** is used to visually determine whether a relation is a function. A relation is a function if there are no vertical lines that intersect the graph at more than one point.

*Y's can repeat – FUNCTION

*X's CAN'T repeat – NOT a FUNCTION!

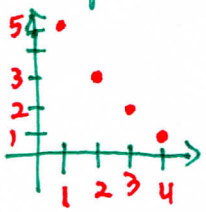
Ex) Express the relation $\{(1,5),(2,3),(3,2),(4,1)\}$ as a table, as a graph, and as a mapping diagram. Give the domain and range. Tell whether the relation is a function. Explain.

Table

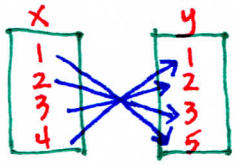
x	y
1	5
2	3
3	2
4	1

order

Graph



Mapping Diagram



order order

Domain: (x-values) {1, 2, 3, 4}

Range: (y-values) {1, 2, 3, 5}

Function, because none of the x-values repeats.

Ex) Find the domain and range of the relation. Tell whether the relation is a function. Explain.

a) $\{(7,-1),(9,-7),(12,-1),(7,0),(15,0)\}$

Domain: {7, 9, 12, 15}

Range: {-7, -1, 0}

Not a Function because the domain repeats.

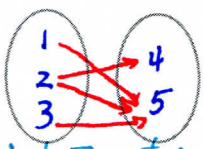
b) $\{(1,5),(2,3),(3,2),(4,5)\}$

D: {1, 2, 3, 4}

R: {2, 3, 5}

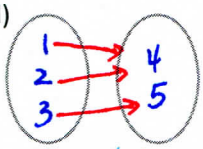
Function, because the domain doesn't repeat.

c)



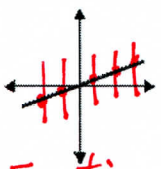
Not Function

d)

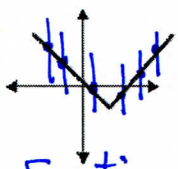


Function

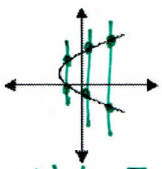
Ex 6. Use the **vertical line test** to determine whether the graph represents a function. Explain.



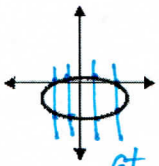
Function



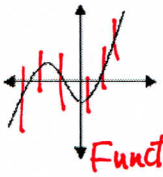
Function



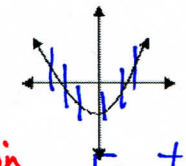
Not a Function, because the graph fails the Vertical Line Test.



Not a Function, because the graph fails the VLT.



Function



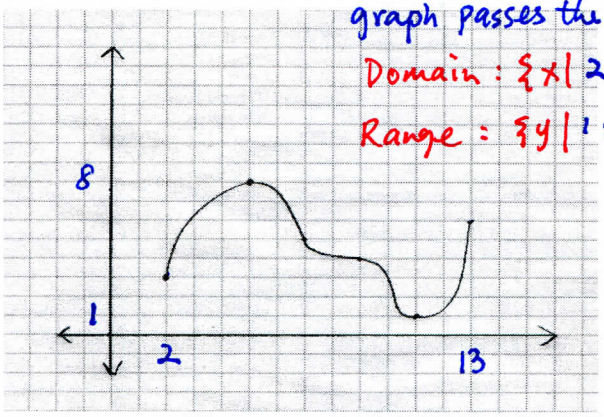
Function, because the graph passes the VLT.

Domain & Range: Domain II. Range =

-Need to put in Set Notation

Ex 1. Find the domain & range in set notation. Is the relation a function? Explain.

Function, because the graph passes the VLT.

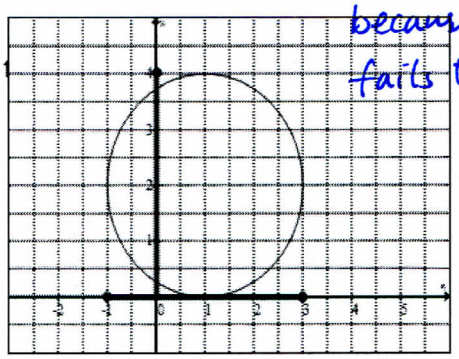


Domain: $\{x \mid 2 \le x \le 13\}$

Range: $\{y \mid 1 \le y \le 8\}$

Ex 2. Find the domain and range in set notation. Is the relation a function? Explain.

Not a Function, because the graph fails the VLT.

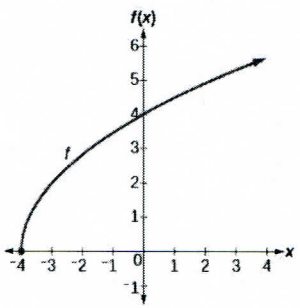


Domain: $\{x \mid -1 \le x \le 3\}$

Range: $\{y \mid 0 \le y \le 4\}$

Ex 3. Find the domain and range in set notation. Is the relation a function? Explain.

Function, because the graph passes the VLT.

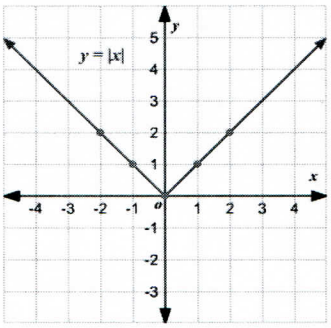


Domain: $\{x \mid x \ge -4\}$

Range: $\{y \mid y \ge 0\}$

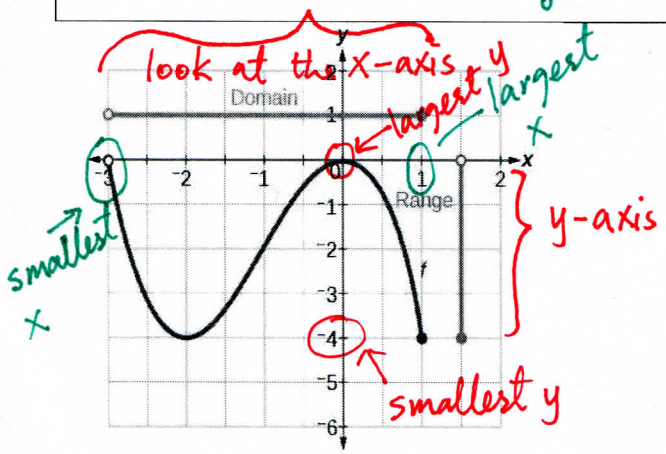
Ex 4. Find the domain and range in set notation. Is the relation a function? Explain.

Function, because the graph passes the VLT.



Domain: $\{x \mid x \in R\}$ All Real #'s

Range: $\{y \mid y \ge 0\}$



Domain: smallest x-value → largest x-value
most left x most right x

$\{x \mid -3 < x \le 1\}$

Range: smallest y-value → largest y-value
lowest highest

$\{y \mid -4 \le y \le 0\}$

0 : < or >

● : ≤ or ≥