Algebra 2 Notes
Section 1.6 – Relations and Functions

Name: _key_

A ___relation___ is a pairing of input values with output values. It can be shown as a set of ___ordered pairs___ (x, y) where x is an ___input___ and y is an ___output___.

The set of input values for a relation is called the ___domain___, and the set of output values is called the ___range___.

$$(x, y) \rightarrow (input, output) \rightarrow (domain, range)$$

Mapping Diagram	Set of Order Pairs
Domain Range	$\{(2, -1), (2, 5), (2, 11)\}$

Domain → -1, 5, 11; element 2 maps to -1, 5, 11

Example 1:   Give the domain and range for each relation.

a. $\{(2,3), (4,-1), (-6,0), (-8,-2)\}$

Domain:
$\{-8, -6, 2, 4\}$

Range:
$\{-2, -1, 0, 3\}$

b.

First-Class Stamp Rates						
Year	1900	1920	1940	1960	1980	2000
Rate (cents)	2	2	3	4	15	33

Domain: $\{1900, 1920, 1940, 1960, 1980, 2000\}$

Range: $\{2, 2, 3, 4, 15, 33\}$

A relation in which the first coordinate is NEVER repeated is called a ___function___.
In a ___function___, there is only one output for each input, so each element of the domain is mapped to ___exactly one___ element in the range.
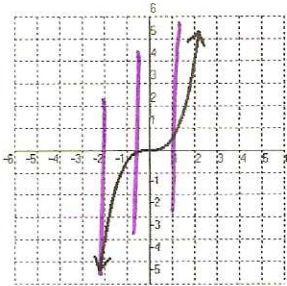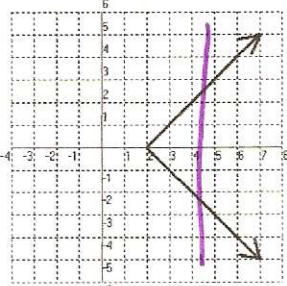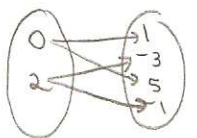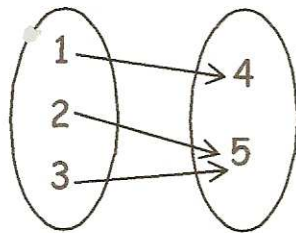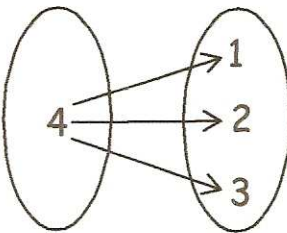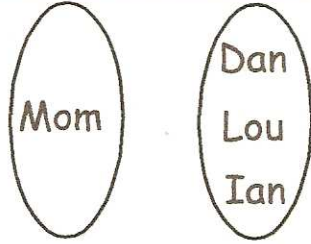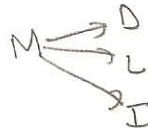
IMPORTANT: Although a single input in a function cannot be mapped to more than one output, two or more different inputs can be mapped to the same output.

Every point on a vertical line has the same ___x-coordinate___, so a vertical line CANNOT represent a function. If a vertical line passes through more than one point on the graph of a relation, the relation must have more than one point with the same ___x-coordinate___. Therefore the relation is NOT a function.

To summarize, a function is a relation where each element in the domain has only ___ONE___ corresponding element in the range, or

- given the order pairs, the x's do not ___repeat___
- the graph passes the ___vertical line test___
- given the mapping, each domain goes to a ___different___ element of the range

Example 2:   Are the following functions? WHY or WHY NOT?

a.

YES

passes VLT

b.

NO

fails VLT

c. $\{(0,1),(2,-3),(0,5),(2,-1)\}$

NO

x-values repeat

d.

x	-2	-1	0	1	2
y	4	1	0	1	4

YES

*remember, it is OK for y-values to repeat

x-values do NOT repeat

e.

1 → 4
2 → 5
3 → 5

YES

each x-value assigned to only one y-value

f.

4 → 1
4 → 2
4 → 3

NO

domain value of 4 is assigned to more than 1 range value

Mom   Dan Lou Ian

g. Is it a function if mom is the domain? Why or why not?

M → D
M → L
M → I

NO

domain value assigned to more than one range value

h. Is it a function if the sons are the domain? Why or why not?

D → M
L → M
I → M

YES

each domain value assigned to only one range value

Last names and social security numbers

i. Is it a function if the last names are the domain? Why or why not?

NO

More than one "Smith", so would be assigned to many different SSNs.

j. Is it a function if the social security numbers are the domain? Why or why not?

YES

SSN are unique and assigned to only one individual