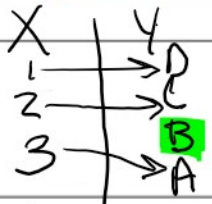
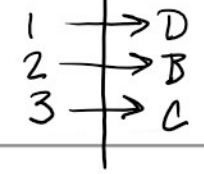
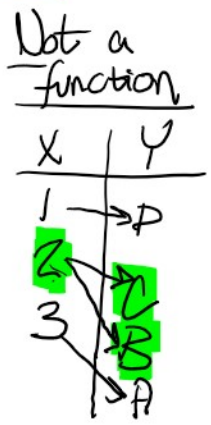
Relations and Functions A **relation** can be represented as a set of ordered pairs or as an equation; the relation is then the set of all ordered pairs (x, y) that make the equation true. A **function** is a relation in which each element of the domain is paired with exactly one element of the range.

One-to-One Function	Each element of the domain pairs to exactly one **unique** element of the range.	
Onto Function	Each element of the range also corresponds to an element of the domain.	
Both One-to-One and Onto	Each element of the domain is paired to exactly one element of the range and each element of the range.	



Example **State the domain and range of the relation. Does the relation represent a function?**

x	y
−1	5
0	3
1	−1
2	1
3	3

The domain and range are both all real numbers. Each element of the domain corresponds with exactly one element of the range, so it is a function.

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

it is a function

Both

Exercises

State the domain and range of each relation. Then determine whether each relation is a *function*. If it is a function, determine if it is *one-to-one*, *onto*, *both*, or *neither*.

1. {(0.5, 3), (0.4, 2), (3.1, 1), (0.4, 0)}

X Y

$D = \{0.5, 0.4, 3.1\}$

$R = \{3, 2, 1, 0\}$

Not a function

2. {(−5, 2), (4, −2), (3, −11), (−7, 2)}

$D = \{-5, 4, 3, -7\}$

$R = \{2, -2, -11\}$

is a function

onto

3. {(0.5, −3), (0.1, 12), (6, 8)}

4. {(−15, 12), (−14, 11), (−13, 10), (−12, 12)}

3. {(0.5, –3), (0.1, 12), (6, 8)}

4. {(–15, 12), (–14, 11), (–13, 10), (–12, 12)}