

## 2.1. Basics of Functions and their graphs (Part I)

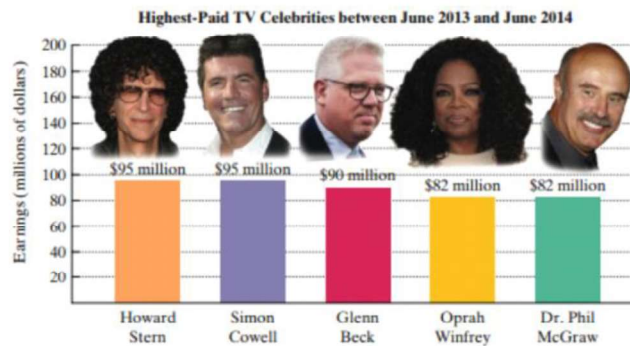
Monday, September 9, 2019

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Obj 1: Definition of a Relation and Find the Domain and the Range of a Relation.

Definition of a Relation:

A **Relation** is a set of ordered pairs.



$R_1 = \{ (\text{Stern}, 95); (\text{Cowell}, 95); (\text{Beck}, 90); (\text{Winfrey}, 82); (\text{McGraw}, 82) \}$ . This is an example of a relation.

$R_2 = \{ (95, \text{Stern}); (95, \text{Cowell}); (90, \text{Beck}); (82, \text{Winfrey}); (82, \text{McGraw}) \}$ . This is another example of a relation.

The **Domain** of a relation is the set of all the first components of the ordered pairs in the relation.

For the first relation  $R_1$ :

Domain =  $\{ \text{Stern}, \text{Cowell}, \text{Beck}, \text{Winfrey}, \text{McGraw} \}$

For the second relation  $R_2$ .

$$\text{Domain} = \{95, 90, 82\}.$$

The **Range** of a relation is the set of all the second components of the ordered pairs in the relation.

$$\text{For } R_1: \text{Range} = \{95, 90, 82\}$$

$$\text{For } R_2: \text{Range} = \{\text{Stem, Cowell, Beck, Winfrey, McGraw}\}$$

Another example of a relation:

Buy ticket(s) for an event. A ticket costs you \$5.

You also have to pay a flat rate of \$2 regardless of how many tickets you buy.

| # of tickets you buy | cost |
|----------------------|------|
| 1                    | \$7  |
| 2                    | \$12 |
| 3                    | \$17 |
| 4                    | \$22 |
| 5                    | \$27 |

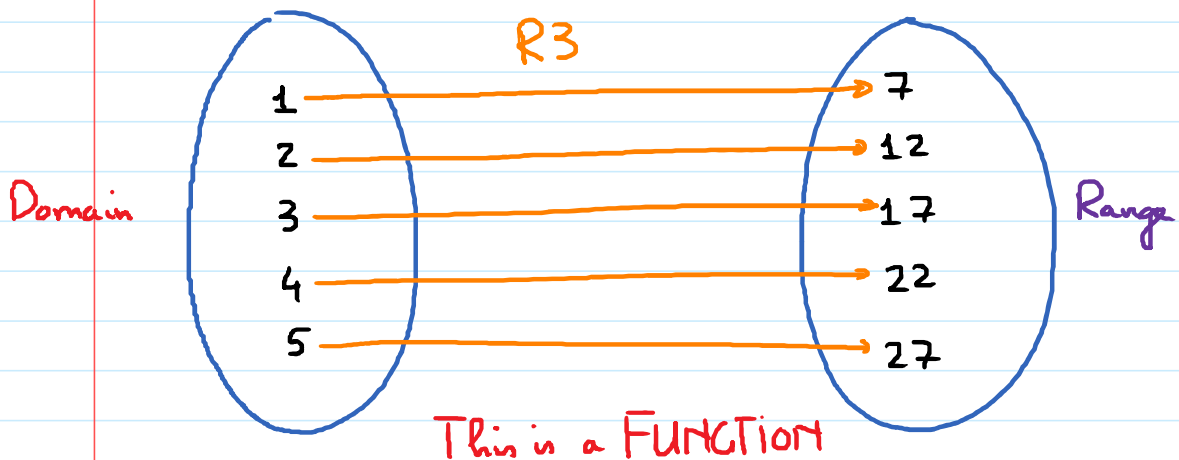
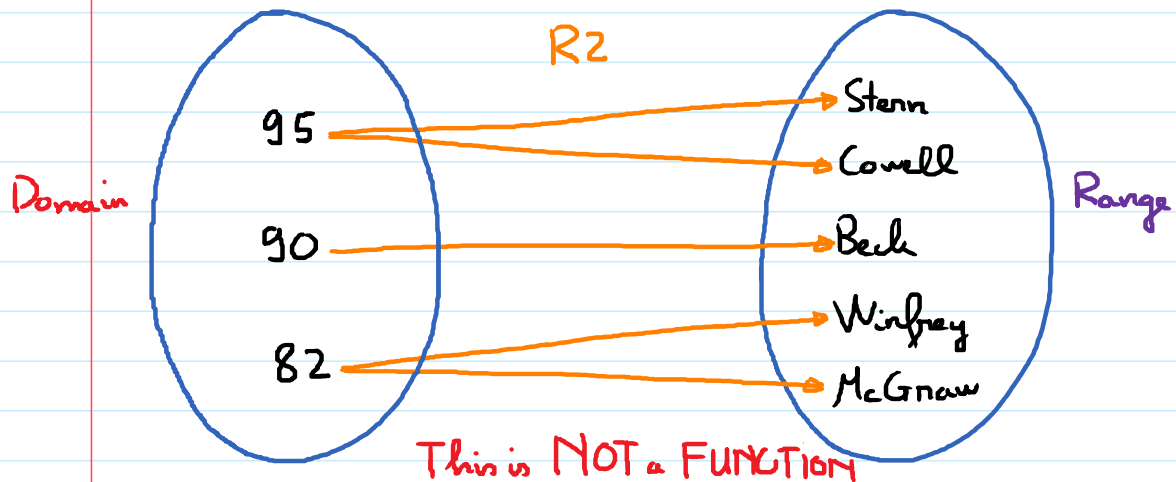
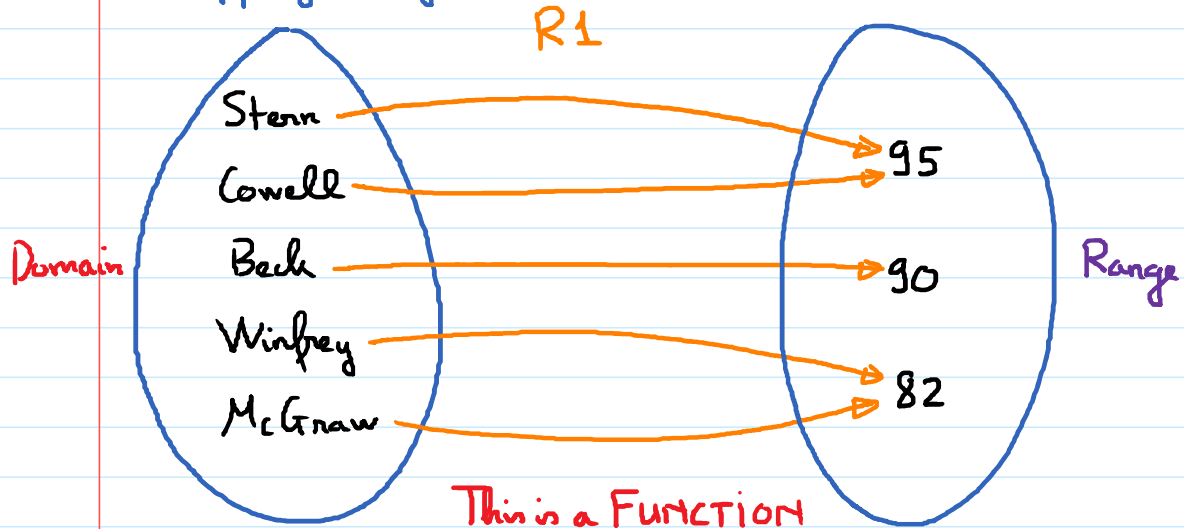
$$\text{Relation } R_3 = \{(1, 7), (2, 12), (3, 17), (4, 22), (5, 27)\}$$

$$\text{Domain of } R_3 = \{1, 2, 3, 4, 5\}$$

$$\text{Range of } R_3 = \{7, 12, 17, 22, 27\}$$

## Obj 2: Definition of a Function and Determine whether a relation is a function.

Mapping Diagrams:



## Definition of a function.

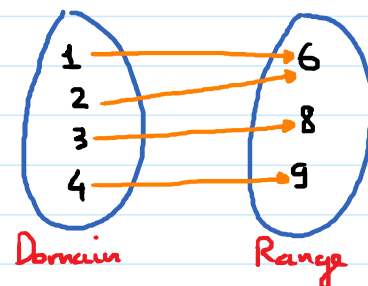
Def 1: A function is a relation in which no two ordered pairs have the same first components and different second components.

Def 2: Equivalently, a function is a correspondence from a first set called the domain to a second set called the range such that each element in the domain corresponds to exactly one element in the range.

E.g. Determine whether a relation is a function.

Ⓐ  $\{(1,6); (2,6); (3,8); (4,9)\}$

This is a function.



Ⓑ  $\{(6,1); (6,2); (8,3); (9,4)\}$

This is NOT a function.

