

Chapter 2: Relations and Functions

Concept:

Cartesian products of sets – equality of ordered pairs- triple product- relations- functions- domain- range- different types of functions- algebra of functions.

Notes:

- If $(a,b) = (c,d)$ then $a = c$ and $b = d$.
- $A \times B = \{ (x,y) / x \in A, y \in B \}$
- $A \times A \times A = \{ (x,y,z) / x, y, z \in A \}$
- A relation R is a subset of the Cartesian product.
- A function is a relation with every element of first set has one only one image in second set.
- The set of all first elements of the ordered pairs in a function is called domain.
- The set of all second elements of the ordered pairs in a function is called the range.
- Second set itself is known as co-domain.

Text book questions

Ex: 2.1

Questions: 1, 2*, 5*, 7*

Ex: 2.2

Questions: 1, 2, 6, 7*

Ex: 2.3

Questions: 2*, 5*

Misc. Ex:

Questions: 3*, 4, 6, 8, 11, 12

Example

Question: 22*

Extra/HOT questions

1. Find x and y if $(x^2-3x, y^2-5y) = (-2, -6)$.
2. Draw the graph of the following functions:
 - a) Modulus function in $[-4, 4]$
 - b) Signum function in $[-6, 6]$
 - c) Greatest integer function in $[-3, 4]$

3. Find the domain of the following functions:

a) $f(x) = \frac{x^2-1}{x-1}$

b) $f(x) = \frac{3x+1}{x^2-5x+6}$

c) $f(x) = \frac{2x-3}{(x-1)(x+2)}$

4. Find the domain and range of the following functions:

a) $f(x) = \frac{1}{9-x^2}$

b) $f(x) = \sqrt{x^2-1}$

c) $f(x) = \frac{1}{x^2+4}$

d) $f(x) = \frac{|x|}{1+|x|}$

5. If $f(x) = x^2 + \frac{1}{x^2}$ then show that $f(a) = f(1/a)$ and also evaluate $f(3/2) - f(2/3)$

6. Let $R = \{(x,y) / x, y \in \mathbb{N}, x+2y = 13\}$ then write R as an ordered pair and also find the domain and range.

7. Let $A = \{x / x \text{ is a natural number } < 12\}$ and R be a relation in A defined by $(x,y) \in R$ if $x+y = 12$, then write R.

8. A function f is defined on the set of natural numbers as

$$f(x) = \begin{cases} x^2 & \text{if } 1 \leq x < 5 \\ x + 3 & \text{if } 5 < x \leq 8 \\ \frac{x-3}{2} & \text{if } 8 < x \leq 11 \end{cases}$$

Write the function in roster form and also find the domain and range of the function.

9. Let $A = \{1,2,3,4\}$, $B = \{-1, 0, 1\}$ and $C = \{3, 4\}$ then verify the following:

a) $A \times (B \cup C) = (A \times B) \cup (A \times C)$

b) $A \times (B - C) = (A \times B) - (A \times C)$

c) $A \times (B \cap C) = (A \times B) \cap (A \times C)$

10. If $A = \{-3, -2, 0, 2, 3\}$ write the subset B of $A \times A$ such that first element of B is either -3 or +3.
