Important Questions Class 11 Maths Chapter 2 Relations and Functions

Important Questions & Answers For Class 11 Maths Chapter 2 Relations and Functions

Q.1: Write the range of a Signum function.

Solution:

The real function f: R → R defined by

is called the signum function. Domain of f = R, Range of f = {1, 0, − 1}

Q.2: The Cartesian product A × A has 9 elements among which are found (−1, 0) and (0,1). Find the set A and the remaining elements of A × A.

$$f(x) = \begin{cases} 1, & if \ x > 0 \\ 0, & if \ x = 0 \\ -1, & if \ x < 0 \end{cases}$$

Solution:

We know that,

If n(A) = p and n(B) = q, then n(A × B) = pq

From the given,

n(A × A) = 9

n(A) × n(A) = 9,

n(A) = 3 ......(i)

The ordered pairs (-1, 0) and (0, 1) are two of the nine elements of A × A.

Therefore, A × A = {(a, a) : a ∈ A}

Hence, -1, 0, 1 are the elemets of A. .....(ii)

From (i) and (ii),

A = {-1, 0, 1}

The remaining elements of set A × A are (-1, -1), (-1, 1), (0, -1), (0, 0), (1, -1), (1, 0) and (1, 1).

Q.3: Express the function f: A—R. f(x) = x² − 1. where A = { -4, 0, 1, 4) as a set of ordered pairs.

Solution:

Given,

A = {-4, 0, 1, 4}

$f(x) = x^2 - 1$

$f(-4) = (-4)^2 - 1 = 16 - 1 = 15$

$f(0) = (0)^2 - 1 = -1$

$f(1) = (1)^2 - 1 = 0$

$f(4) = (4)^2 - 1 = 16 - 1 = 15$

Therefore, the set of ordered pairs = {(-4, 15), (0, -1), (1, 0), (4, 15)}

Q.4: Assume that A = {1, 2, 3,...,14}. Define a relation R from A to A by R = {(x, y) : 3x − y = 0, such that x, y ∈ A}. Determine and write down its range, domain, and codomain.

Solution:

It is given that the relation R from A to A is given by R = {(x, y): 3x − y = 0, where x, y ∈ A}.

It means that R = {(x, y) : 3x = y, where x, y ∈ A}

Hence, R = {(1, 3), (2, 6), (3, 9), (4, 12)}

We know that the domain of R is defined as the set of all first elements of the ordered pairs in the given relation.

Hence, the domain of R = {1, 2, 3, 4}

To determine the codomain, we know that the entire set A is the codomain of the relation R.

Therefore, the codomain of R = A = {1, 2, 3,...,14}

As it is known that, the range of R is defined as the set of all second elements in the relation ordered pair.

Hence, the Range of R is given by = {3, 6, 9, 12}

Q.5: Let f(x) = x² and g(x) = 2x + 1 be two real functions. Find

(f + g) (x), (f −g) (x), (fg) (x), (f/g) (x)

Solution:

Given,

f(x) = x^2 and g(x) = 2x + 1

(f + g) (x) = x^2 + 2x + 1

(f − g) (x) = x^2 -(2x + 1) = $x^2 − 2x − 1$

(fg) (x) = x^2(2x + 1) = $2x^3 + x^2$

(f/g) (x) = $x^2/(2x + 1)$, x ≠ -1/2

Q.6: Redefine the function: f(x) = |x − 1| − |x + 6|. Write its domain also.

Solution:

Given function is f(x) = |x − 1| − |x + 6|

Redefine of the function is:

The domain of this function is R.

Q.7: The function f is defined by

Draw the graph of f(x).

$$f(x) = \begin{cases} -x + 1 + x + 6, & x \le -6 \\ -x + 1 - x - 6, & -6 \le x < 1 \\ x - 1 - x - 6, & x \ge 1 \end{cases}$$

$$= \begin{cases} 7, & x \le -6 \\ -2x - 5, & -6 \le x < 1 \\ -7, & x \ge 1 \end{cases}$$

Solution:

f(x) = 1 − x, x < 0, this gives

f(− 4) = 1 − (− 4)= 5;

f(− 3) =1 − (− 3) = 4,

f(− 2) = 1 − (− 2)= 3

f(−1) = 1 − (−1) = 2; etc,

$$f(x) = \begin{cases} 1 - x, & x < 0 \\ 1, & x = 0 \\ x + 1, & x > 0 \end{cases}$$

Also, f(1) = 2, f (2) = 3, f (3) = 4, f(4) = 5 and so on for f(x) = x + 1, x > 0.

Thus, the graph of f is as shown in the below figure.

Q.8: Find the domain and range of the real function f(x) = x/1+x^2.

Solution:

Given real function is f(x) = x/1+x^2.

$1 + x^2 \neq 0$

$x^2 \neq -1$

Domain : $x \in R$

Let $f(x) = y$

$y = x/1+x^2$

$\Rightarrow x = y(1 + x^2)$

$\Rightarrow yx^2 - x + y = 0$

This is quadratic equation with real roots.

$(-1)^2 - 4(y)(y) \geq 0$

$1 - 4y^2 \geq 0$

$\Rightarrow 4y^2 \leq 1$

$\Rightarrow y^2 \leq 1/4$

$\Rightarrow -\frac{1}{2} \leq y \leq \frac{1}{2}$

$\Rightarrow -1/2 \leq f(x) \leq \frac{1}{2}$

Range = $[-\frac{1}{2}, \frac{1}{2}]$

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