NCERT Solutions for Class-XI Maths

Chapter-2 Exercise-2.3

NCERT Math Class 11

1. Which of the following relations are functions? Give reasons. If it is a function, determine its domain and range.

(i) $\{(2,1),(5,1),(8,1),(11,1),(14,1),(17,1)\}$

(ii) $\{(2,1),(4,2),(6,3),(8,4),(10,5),(12,6),(14,7)\}$

(iii) $\{(1,3),(1,5),(2,5)\}$

1. (i) $\{(2,1),(5,1),(8,1),(11,1),(14,1),(17,1)\}$

Since $2,5,8,11,14$, and 17 are the elements of the domain of the given relation having their unique images, this relation is a function. Here, domain $=\{2,5,8,11,14,17\}$ and range $=\{1\}$

(ii) $\{(2,1),(4,2),(6,3),(8,4),(10,5),(12,6),(14,7)\}$

Since $2,4,6,8,10,12$, and 14 are the elements of the domain of the given relation having their unique images, this relation is a function.

Here, domain $=\{2,4,6,8,10,12,14\}$ and range $=\{1,2,3,4,5,6,7\}$

(iii) $\{(1,3),(1,5),(2,5)\}$

Since the same first element i.e., 1 corresponds to two different images i.e., 3 and 5, this relation is not a function.

2. Find the domain and range of the following real functions:

(i) $f(x)=-|x|$

2. **Given:** $f(x)=-|x|$

As we know,

$|x| = \begin{cases} x, & \text{if } x\geq 0 \\ -x, & \text{if } x<0 \end{cases}$

$f(x)=-|x| = \begin{cases} -x, & \text{if } x\geq 0 \\ x, & \text{if } x<0 \end{cases}$

Since, f(x) is defined for x Є R, the domain of f is R.

It can be observed that the range of f(x) = -|x| is all real numbers except positive real numbers.

Thus the range of function is f(x) is (-∞, 0].

(ii) $f(x) = \sqrt{9 - x^2}$

Solution: Given: $f(x) = \sqrt{9 - x^2}$

Since, f(x) is defined for all real numbers that are greater than or equal to -3 and less than or equal to 3, the domain of f(x) is [-3, 3].

For any value of x such that $-3 \le x \le 3$, the value of f(x) will lie between 0 and 3.

Thus the range of function is f(x) is [0,3].

3. A function f is defined by $f(x) = 2x - 5$. Write down the values of

(i) $f(0)$,

(ii) $f(7)$,

(iii) $f(-3)$

3. The given function is $f(x) = 2x - 5$.

Therefore,

(i) $f(0) = 2 \times 0 - 5 = 0 - 5 = -5$

(ii) $f(7) = 2 \times 7 - 5 = 14 - 5 = 9$

(iii) $f(-3) = 2 \times (-3) - 5 = -6 - 5 = -11$

4. The function 't' which maps temperature in degree Celsius into temperature in degree Fahrenheit is defined by $t(C) = \frac{9C}{5} + 32$

Find (i) t(0) (ii) t(28) (iii) t(–10) (iv) The value of C, when t(C) = 212.

4. **Given:** $t(C) = \frac{9C}{5} + 32$

(i) t(0) $t(0) = \frac{9 \times 0}{5} + 32$

$\Rightarrow$ t(0) = 32

(ii) t(28) $t(28) = \frac{9 \times 28}{5} + 32$

$\Rightarrow t(28) = \frac{252}{5} + 32$

$\Rightarrow t(28) = \frac{252 + 160}{5} = \frac{412}{5}$

(iii) t(-10) $t(-10) = \frac{9 \times (-10)}{5} + 32$

$\Rightarrow$ t(-10) = -18 + 32 = 14

(iv) t(C) = 212

$t(C) = \frac{9C}{5} + 32$

$212 = \frac{9C}{5} + 32$

$\Rightarrow \frac{9C}{5} = 212 - 32$

$\Rightarrow \frac{9C}{5} = 180$

$\Rightarrow C = \frac{180 \times 5}{9} = 100$

$\Rightarrow$ Value of C, when t(C) is 212 = 100.

5. Find the range of each of the following functions.

(i) $f(x) = 2 - 3x, x \in \mathbf{R}, x > 0$.

(ii) $f(x) = x^2 + 2, x$, is a real number.

(iii) $f(x) = x, x$ is a real number

5. (i) $f(x) = 2 - 3x, x \in \mathbf{R}, x > 0$

The values of $f(x)$ for various values of real numbers $x > 0$ can be written in the tabular form as

x	0.01	0.1	0.9	1	2	2.5	4	5	…
f(x)	1.97	1.7	–0.7	–1	–4	–5.5	–10	–13	…

Thus, it can be clearly observed that the range of f is the set of all real numbers less than 2.

i.e., range of $f = (-\infty, 2)$

Alter:

Let $x > 0$

$\Rightarrow 3x > 0$

$\Rightarrow 2 - 3x < 2$

$\Rightarrow f(x) < 2$

$\therefore$ Range of $f = (-\infty, 2)$

(ii) $f(x) = x^2 + 2, x$, is a real number

The values of $f(x)$ for various values of real numbers x can be written in the tabular form as

x	0	±0.3	00.8	±1	±2	±3	…
$f(x)$	2	2.09	2.64	3	6	11	….

Thus, it can be clearly observed that the range of f is the set of all real numbers greater than 2 .

i.e., range of $f = [2, \infty)$

Alter:

Let x be any real number. Accordingly,

$\Rightarrow x^2 \geq 0$

$\Rightarrow x^2 + 2 \geq 0 + 2$

$\Rightarrow x^2 + 2 \geq 2$

$\Rightarrow f(x) \geq 2$

$\therefore$ Range of $f = [2, \infty)$

(iii) $f(x) = x, x$ is a real number

It is clear that the range of f is the set of all real numbers. $\therefore$ Range of $f = \mathbf{R}$