

CBSE Class-11 Mathematics
NCERT Solutions
Chapter - 2 Relations and Functions
Exercise 2.3

1. Which of the following 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) $\{(1, 3), (1, 5), (2, 5)\}$

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

All values of x are distinct. Each value of x has a unique value of y .

Therefore, the relation is a function.

\therefore Domain of function = $\{2, 5, 8, 11, 14, 17\}$

Range of function = $\{1\}$

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

All values of x are distinct. Each value of x has a unique value of y .

Therefore, the relation is a function.

\therefore Domain of function = $\{2, 4, 6, 8, 10, 12, 14\}$

Range of function = $\{1, 2, 3, 4, 5, 6, 7\}$

(iii) Given: Relation is $\{(1, 3), (1, 5), (2, 5)\}$

This relation is not a function because there is an element 1 which is associated to two elements 3 and 5.

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

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

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

Ans. (i) Given: $f(x) = -|x|$. The function is defined for all real values of x .

\therefore Domain of the function = \mathbb{R}

Now, when $x < 0$, then $|x| = -x$

$$\therefore f(x) = -(-x), x < 0$$

When $x = 0$, $|x| = 0$

$$\therefore f(x) = -|0| = 0$$

When $x > 0$, $|x| = x$

$$\therefore f(x) = -x < 0$$

Therefore, $f(x) \leq 0$ for all real values of x .

$$\therefore \text{Range of function} = (-\infty, 0]$$

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

The function is not defined when $9-x^2 < 0$.

$$\therefore \text{Domain of function} = \{x: 9-x^2 \geq 0\} = \{x: x^2-9 \leq 0\}$$

$$= \{x: (x+3)(x-3) \leq 0\} = [-3, 3]$$

$$\therefore \text{Range of function} = [0, 3]$$

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

(i) $f(0)$

(ii) $f(7)$

(iii) $f(-3)$

Ans. Given: $f(x) = 2x - 5$

(i) Putting $x = 0$,

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

(ii) Putting $x = 7$,

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

(iii) Putting $x = -3$,

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

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 $t(C) = 212$.

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

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

(ii) Putting $C = 28$, $t(28) = \frac{9 \times 28}{5} + 32 = \frac{252 + 160}{5} = \frac{412}{5}$

(iii) Putting $C = -10$, $t(-10) = \frac{9 \times (-10)}{5} + 32 = -18 + 32 = 14$

(iv) Putting $t(C) = 212$, $212 = \frac{9C}{5} + 32$

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

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

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

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

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

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

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

Ans. (i) Given: $f(x) = 2 - 3x$, $x \in \mathbb{R}$ and $x > 0$

$$\therefore 3x > 0 \Rightarrow -3x < 0$$

$$\Rightarrow 2 - 3x < 2$$

\therefore Range of function

$$= \{a \in \mathbb{R} : a < 2\} = (-\infty, 2)$$

(ii) Given: $f(x) = x^2 + 2$, $x \in \mathbb{R}$

$$\therefore x^2 \geq 0 \text{ for } x \in \mathbb{R}$$

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

\therefore Range of function

$$= \{a \in \mathbb{R} : a \geq 2 \forall a \in \mathbb{R}\} = [2, \infty)$$

(iii) Given: $f(x) = x$, $x \in \mathbb{R}$

\therefore Range of function = \mathbb{R}