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Answers Key:

Case Study Questions

1. (i) (a)
   (ii) (b)
   (iii) (c)
   (iv) (a)
   (v) (c)
2. (i) b
   (ii) b
   (iii) (a)
   (iv) (a)
   (v) (c)

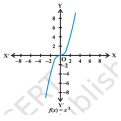
5 Marks

3. Here f(x) = x + 1 and g(x) = 2x - 3.
   Now (f +g) (x) = f(x) +g(x)
   = x + 1 + 2x - 3 = 3x - 2
   (f- g) (x) = f(x) -g(x) =x+ 1-(2x- 3)
   =x+1-2x+3=-x+4
   $\frac{(f)}{(g)}(x) = \frac{f(x)}{g(x)} = \frac{x+1}{2x-3}, x \neq \frac{3}{2}$
4. Here A = {9, 10, 11, 12, 13}
   For n = 9,f(9) = 3
   ($\because$ 9 = 3 x 3 and 3 is highest prime factor of 9)
   For n = 10, f(10) = 5 ($\because$ 10 = 2 x 5)
   For n = 11, f(11) = 11 ($\because$ 11 = 1 x 11)
   For n = 12, f(12) = 3 ($\because$ 12 = 3 x 2 x 2)
   For n = 13, f(13) = 13 ($\because$ 13 = 1 x 13)
   $\therefore$ Range of f= {5, 11, 3, 13} = {3, 5, 11, 13}

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3 Marks

5. (i) {(x,y) : $x \in P, y \in Q, x = y + 2$}
   (ii) {(5, 3), (6, 4), (7, 5)}
   (iii) Domain (R) = {5,6,7} and Range (R) = {3,4, 5}
6. (i) Here the 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.
   So the relation is a function.
   $\therefore$ Domain of function = {2,5, 8,11,14, 17}
   Range of function = {1}.
   (ii) Here the 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. So 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) Here the 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.
7. We have, f(0) = 0, f(1) = 1, f(–1) = –1, f(2) = 8, f(–2) = –8, f(3) = 27; f(–3) = –27, etc.
   Therefore, f = {(x,x^3): x$\in$R}.
   The graph of f is given



8. The given real function is $f(x) = \sqrt{x-1}$.
   It can be seen that $\sqrt{x-1}$ is defined for $(x-1) \geq 0$
   i.e., $f(x) = \sqrt{(x-1)}$ is defined for $x \geq 1$.
   Therefore, the domain of f is the set of all real numbers greater than or equal to 1 i.e., the domain of $f = [1, \infty]$
   As $x \geq 1 \Rightarrow (x-1) \geq 0 \Rightarrow \sqrt{x-1} \geq 0$
   Therefore, the range of f is the set of all real numbers greater than or equal to 0 i.e., the range of $f = [0, \infty)$

2 Marks

9. x=2, y=1
10. Number of elements in set A = 3
    Number of elements in set B = 3
    Number of elements in A x B = 3 x 3 = 9.

11. Here R = {(x, x^3) : x is a prime number less than 10}
    Putting x = 2, 3, 5, 7
    R = {(2, 8), (3, 27), (5, 125), (7, 343)}
12. The domain of R is the set of natural numbers N. The codomain is also N. The range is the set of even natural numbers.
    Since every natural number n has one and only one image, this relation is a function.
13. Since x^2–5x + 4 = (x – 4) (x –1), the function f is defined for all real numbers except at x = 4 and x = 1. Hence the domain of f is R – {1, 4}.

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