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Q.11)	$f(x) = (x-3)$. Find the Domain and Range.
Sol.11)	$f(x) = (x-3)$ Domain: $f(x)$is real for all values of x such that; $x \in R$ ∴ Domain=R Range: let $y = f(x)$ $\Rightarrow y = (x-3)$ $\Rightarrow y = \begin{cases} (x-3): x-3 \geq 0; x \geq 3 \\ -(x+3): x-3 < 0; x < 3 \end{cases}$ $y = x-3; x \geq 3$ $\Rightarrow x = y+3$ We have, $x \geq 3$ $y+3 \geq 0$ $y \geq 0$ $y \in [0,00]$ $y = -(x-3); x < 3$ $\Rightarrow y = -x+3$ $\Rightarrow x = 3-y$ We have, $x < 3$ $3-y < 3$ $-y < 0$ $\Rightarrow y > 0 \therefore y \in [0,00]$ $y \in [0,00]$ and $y \in [0,00]$ ∴ Range $= [0,00]$ ans. .... $\{since, when\ x = 1\ then\ y = 0\}$
Q.12)	Find Domain and Range of $f(x) = 1-(x-2)$
Sol.12)	We have, $f(x) = 1-(x-2)$ Domain: $f(x)$is real for all values of x such that; $x \in R$ ∴ Domain=R Range: let $y = f(x)$ $\Rightarrow y = 1-(x-2)$ $\Rightarrow y = \begin{cases} 1-(x-2): x-2 \geq 0; x \geq 2 \\ 1+(x-2): x-2 < 0; x < 2 \end{cases}$ $\Rightarrow y = \begin{cases} -x+3: x \geq 2 \\ x-1: x < 2 \end{cases}$ $y = -x+3; x \geq 2$ $\Rightarrow x = 3-y$ We have, $x \geq 2$ $3-y \geq 2$ $-y \geq -1$ $y \leq 1$ $y \in [-00,1]$ $y = x-1; x < 2$ $\Rightarrow x = y+1$ We have, $x < 2$ $y+1 < 2$ $y < 1$ $\Rightarrow\ y \in [-00,1]$ ∴ Range $= [-00,1]$ ans. .... $\{when\ x = 2\ then\ y = 1 \therefore \text{y} = 1 \text{ is included in Range}\}$
Q.13)	Find the Domain & Range of $f(x) = \frac{1}{2-\sin(3x)}$
Sol.13)	$f(x) = \frac{1}{2-\sin(3x)}$ Domain: we have, $-1 \leq \sin(3x) \leq 1$ $\Rightarrow 2-\sin(3x) \neq 0$ ∴ Domain$\neq 0$ ∴ $f(x)$is real for all values of x such that; $x \in R$ ∴ Domain=R Range: We have, $-1 \leq \sin(3x) \leq 1$ $\Rightarrow 1 \geq -\sin(3x) \geq -1$ .... $(multiply\ by\ (-1))$ $\Rightarrow -1 \leq -\sin(3x) \leq -1$ $\Rightarrow 1 \leq 2-\sin(3x) \leq 3$ .... $\{adding\ 2\}$ $\Rightarrow \frac{1}{3} \leq -\frac{1}{2-\sin(3x)} \leq 1$ ...... $\left\{if\ a < x < b\ then\ \frac{1}{b} < \frac{1}{x} < \frac{1}{a}\right\}$

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$\Rightarrow \frac{1}{3} \leq -f(x) \leq 1$

$\therefore$ Range $= \left[\frac{1}{3}, 1\right]$ ans.

Q.14) Find the Domain of $f(x) = \sqrt{\frac{1-(x)}{2-(x)}}$

Sol.14)

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

Domain: $f(x)$is real for all values of x such that; $x \in R$

$\frac{1-(x)}{2-(x)} \geq 0$ and $2-(x) \neq 0$

$\Rightarrow \frac{-(1x1-1)}{-(1x1-2)} \geq 0$ and $1x1 \neq 2$ and $x \neq \pm 2$

$\Rightarrow \frac{(1x1-1)(1x1-2)}{(1x1-2)^2} \geq 0$ ..... $\{multiply\ \&\ divide\ by\ (x)-2\}$

$\Rightarrow (1x1-1)(1x1-2) \geq 0$

FIG-7

$1x1 \leq 1$ and $1x1 > 2$

$\pm x \leq 1$ and $\pm x > 2$

$\Rightarrow x \leq 1$ and $-x \leq 1$

$\Rightarrow x \leq 1$ and $x \geq -1$

$x > 2$ and $-x > 2$

$x > 2$ and $x < -2$

FIG.8

Clearly, common solution is

$x \in (-00, -2) \cup [-1,1] \cup (2,00)$ ans.

Q.15) If $f(x) = \frac{x+1}{x-1}$, find $f(f(x))$.

Sol.15) We have, $f(x) = \frac{x+1}{x-1}$

Now, $f(f(x)) = f\left(\frac{x+1}{x-1}\right)$

$= \frac{\frac{x+1}{x-1}+1}{\frac{x+1}{x-1}-1}$

$= \frac{x+1+x-1}{x+1-x+1}$

$= \frac{2x}{2}$

$= x$ ans.

Q.16) Let $f = \{(1,1), (2,3), (0,-1), (-1,-3)\}$ be a linear function. Find $f(x)$.

Sol.16) Let $f(x) = ax + b$

$(1,1) \in f \Rightarrow x = 1$ and $f(x) = 1$

$\therefore 1 = a + b$ .... (1)

$(2,3) \in f \Rightarrow x = 2$ and $f(x) = 3$

$\therefore 3 = 2a + b$ .... (2)

Solving (1) and (2)

$b = -1$ and $a = 2$

$\therefore f(x) = 2x - 1$ ans.

Q.17) $f(x) = \begin{cases} x^2: 0 \leq x \leq 3 \\ 3x: 3 \leq x \leq 10 \end{cases}$

and $g(x) = \begin{cases} x^2: 0 \leq x \leq 2 \\ 3x: 2 \leq x \leq 10 \end{cases}$, Show that f is a function but g is not a function .

Sol.17) We have, $f(x) = \begin{cases} x^2: 0 \leq x \leq 3 \\ 3x: 3 \leq x \leq 10 \end{cases}$

$\therefore f = \{(0,0), (1,1), (2,4), (3,9), (4,12), (5,15), (6,18), (7,21), (8,24), (9,27), (10,30)\}$

Clearly, first element of each ordered pair is different (or) each element has unique image $\therefore$ f is

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	a function Now, $g(x) = \begin{cases} x^2: 0 \leq x \leq 2 \\ 3x: 2 \leq x \leq 10 \end{cases}$ $\therefore g = \{(0,0), (1,1), (2,4), (3,9), (4,12), (5,15), (6,18), (7,21), (8,24), (9,27), (10,30)\}$ Clearly element 2 has two different images 4 and 6 $\therefore g$ is not a function
Q.18)	Let $A = \{9,10,11,12,13\}$; let $f: A \to N$ be defined by $f(n)$ = highest prime factor of . Find the range of f.
Sol.18)	$A = \{9,10,11,12,13\}$ $f(n)$ = highest prime factor of n $f(9)$ = highest prime factor of $9 = 3$ $f(10)$ = highest prime factor of $10 = 5$ $f(11)$ = highest prime factor of $11 = 11$ $f(12)$ = highest prime factor of $12 = 3$ $f(13)$ = highest prime factor of $13 = 13$ $\therefore$ Range $= \{3,5,11,13\}$ ans.
Q.19)	Let f be a subset of $z \times z$ defined by $f = \{(ab, a + b): a, b \in z\}$. Is f is a function? Justify your answer.
Sol.19)	We have, $f = \{(ab, a + b): a, b \in z\}$ Let $a = 2$ & $b = 3$ $\therefore ab = 6$ and $(a + b) = 5$ $\therefore (6,5) \in f$ Now, let $a = 6$ and $(a + b) = 7$ $\therefore (6,7) \in f$ $\Rightarrow (6,5) \in f$ and $(6,7) \in f$ It means element 6 has two different images 5 and 7 $\therefore f$ is not a function ans.

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