CHAPTER-2

RELATIONS & FUNCTIONS

03 MARK TYPE QUESTIONS

Q. NO	**QUESTION**	**MARK**
1.	Redefine the function: f(x) = |x – 1| – |x + 6|. Write its domain also.	3
2.	Find the domain and range of the real function f(x) = x/1+x²	3
3.	What is the fundamental difference between a relation and function? Is every relation a function?	3
4.	Redefine the function: $f(x) = \|x - 1\| - \|x + 6\|$. Write its domain also.	3
5.	Let f and g be two real valued functions, defined by $f(x) = (x + 1)$ and $g(x) = (2x - 3)$. Find $i)f + g$ ii)$f - g$ iii) $\frac{f}{g}$	3
6.	If $f: R \to R$ is defined by $f(x) = 3x + \|x\|$, Prove that $f(2x) - f(-x) - 6x = f(x)$	3

ANSWERS:

Q. NO	ANSWER	MARKS
1.	Given function is $f(x) = \|x - 1\| - \|x + 6\|$ Redefine of the function is: $f(x)=-x+1+x+6, x \le -6$ $-x+1-x-6, -6 \le x < 1$ $x-1-x-6, x \ge 1$ $=7, x \le -6$ $-2x-5, -6 \le x < 1$ $-7, x \ge 1$ The domain of this function is R	3
2.	Given real function is $f(x) = x/1+x^2$. $1 + x^2 \ne 0$ $X^2 \ne -1$ 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. $(-1)^2 - 4(y)(y) \ge 0$ $1 - 4y^2 \ge 0$ $\Rightarrow 4y^2 \le 1$ $\Rightarrow y^2 \le 1/4$ $\Rightarrow -½ \le y \le ½$	3

	$\Rightarrow -1/2 \le f(x) \le \frac{1}{2}$ Range = $[-\frac{1}{2}, \frac{1}{2}]$	
3.	Every function is a relation, but every relation need not be a function. A relation f from A to B is called a function if (i) Dom(f) = A (ii) no two different ordered pairs in f have the same first component. For. e.g. Let A = {a, b, c, d} and B = {1, 2, 3, 4, 5} Some relations f, g and h are defined as follows: f = {(a, 1), (b, 2), (c, 3), (d, 4)} g = {(a, 1), (b, 3), (c, 5)} h = {(a, 1), (b, 2), (b, 3), (c, 4), (d, 5)} In the relation f, f={(a,1),(b,2),(c,3),(d,4)} (i) Dom (f) = A (ii) All first components are different. So, f is a function. In the relation g, (i) Dom (g) ≠ A So, the condition is not satisfied. Thus, g is not a function. In the relation h, h={(a,1),(b,2),(b,3),(c,4),(d,5)} (i) Dom (h) = A (i) Two first components are the same, i.e. b has two different images.	3

<table>
<tr><td></td><td>So, h is not a function.

No, every relation is not a function.</td><td></td></tr>
<tr><td>4.</td><td>Given function is $f(x) = |x-1| - |x+6|$
Redefine of the function is:
$$f(x) = \begin{cases} -x+1+x+6, & x \le -6 \\ -x+1-x-6, & -6 \le x < 1 \\ x-1-x-6, & x \ge 1 \end{cases}$$
$$= \begin{cases} 7, & x \le -6 \\ -2x-5, & -6 \le x < 1 \\ -7, & x \ge 1 \end{cases}$$
The domain of this function is R</td><td></td></tr>
<tr><td>5.</td><td>Given, $f(x) = (x+1)$ and $g(x) = (2x-3)$

i) $(f+g)(x) = f(x) + g(x)$
$= (x+1) + (2x-3)$
$= (3x-2)$
$\Rightarrow (f+g)(x) = (3x-2)$

ii) $(f-g)(x) = f(x) - g(x)$
$= (x+1) - (2x-3)$
$\Rightarrow (f-g)(x) = (4-x)$

iii) $\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)} = \frac{x+1}{2x-3}$</td><td></td></tr>
<tr><td>6.</td><td>$f(x) = 3x + |x|$
$f(2x) = (3(2x) + |2x|) = 6x + 2|x|$
$f(-x) = (3(-x) + |-x|) = -3x + |x|$

$\therefore f(2x) - f(-x) - 6x = (6x + 2|x|) - (-3x + |x|) - 6x$
$= 6x + 2|x| + 3x - |x| - 6x$
$= 3x + |x| = f(x)$

Hence proved.</td><td></td></tr>
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