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Ques - If $f(x) = [x]$ and $g(x) = |x|$. Find the value of $gof\left(-\frac{5}{3}\right) - fog\left(-\frac{5}{3}\right)$.

Solu - $(gof)(x) = g(f(x)) = g([x]) = |[x]|$

$(fog)(x) = f(g(x)) = f(|x|) = [|x|]$

$|[x]| - [|x|]$

$\left|\left[-\frac{5}{3}\right]\right| - \left[\left|-\frac{5}{3}\right|\right]$

$|[-1.66]| - [5/3]$

$|-2| - 1 = 1$

Ques - Find the domain and range of $f(x) = |\sin x|$.

Solu -

Range of $f = [0, 1]$

Domain of $f = R$ (Real number)

Ques - Find the range of $f(x) = \frac{1}{2 - \cos 3x}$.

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Soln - Let,

$$y = f(x) = \frac{1}{2-\cos 3x}$$

$$y = \frac{1}{2-\cos 3x}$$

$$2-\cos 3x = \frac{1}{y}$$

$$2-\frac{1}{y} = \cos 3x$$

$\because$ $-1 \le \cos 3x \le 1$

$\therefore$ $-1 \le 2-\frac{1}{y} \le 1$

$-3 \le -\frac{1}{y} \le 1$

Divide both side by -1,

$$\frac{1}{3} \le y \le 1$$

$\Rightarrow$ Range of $f(x) = \frac{1}{2-\cos 3x}$ is $\left[\frac{1}{3}, 1\right]$.

Ques - If $g(x) = \frac{x^2+2x+3}{x}$ then find Rg (Range of g).

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Sol:- Let,

$$y = g(x) = \frac{x^2+2x+3}{x}$$

$$y = \frac{x^2+2x+3}{x}$$

$$x \cdot y = x^2+2x+3$$

$$= x^2+2x-xy+3$$

$$= x^2+x(2-y)+3$$

$$D = B^2-4AC$$

$$= (2-y)^2-4(1)(3)$$

$$= 4+y^2-4y-12 \geq y^2-4y-8 \geq 0$$

$$\geq$$

$$y^2-4y-8 \geq 0$$

Range →

$$y \in (-\infty, 2-2\sqrt{3}) \cup (2+2\sqrt{3}, \infty)$$

$$y \in R - (2-2\sqrt{3}, 2+2\sqrt{3}) = R_g \text{ (Range of } g(x))$$