



Functions Ex2.2 Q1(i)

Since,  $f: \mathbb{R} \rightarrow \mathbb{R}$  and  $g: \mathbb{R} \rightarrow \mathbb{R}$

$\therefore f \circ g: \mathbb{R} \rightarrow \mathbb{R}$  and  $g \circ f: \mathbb{R} \rightarrow \mathbb{R}$

Now,  $f(x) = 2x + 3$  and  $g(x) = x^2 + 5$

$$g \circ f(x) = g(2x + 3) = (2x + 3)^2 + 5$$

$$\Rightarrow g \circ f(x) = 4x^2 + 12x + 14$$

$$f \circ g(x) = f(g(x)) = f(x^2 + 5) = 2(x^2 + 5) + 3$$

$$\Rightarrow f \circ g(x) = 2x^2 + 13$$

Functions Ex2.2 Q1(ii)

$$f(x) = 2x + x^2 \quad \text{and} \quad g(x) = x^3$$

$$g \circ f(x) = g(f(x)) = g(2x + x^2)$$

$$g \circ f(x) = (2x + x^2)^3$$

$$f \circ g(x) = f(g(x)) = f(x^3)$$

$$\therefore f \circ g(x) = 2x^3 + x^6$$

Functions Ex2.2 Q1(iii)

$$f(x) = x^2 + 8 \text{ and } g(x) = 3x^3 + 1$$

$$\text{Thus, } g \circ f(x) = g[f(x)]$$

$$\Rightarrow g \circ f(x) = g[x^2 + 8]$$

$$\Rightarrow g \circ f(x) = 3[x^2 + 8]^3 + 1$$

$$\text{Similarly, } f \circ g(x) = f[g(x)]$$

$$\Rightarrow f \circ g(x) = f[3x^3 + 1]$$

$$\Rightarrow f \circ g(x) = [3x^3 + 1]^2 + 8$$

$$\Rightarrow f \circ g(x) = [9x^6 + 1 + 6x^3] + 8$$

$$\Rightarrow f \circ g(x) = 9x^6 + 6x^3 + 9$$

Functions Ex2.2 Q1(iv)

$$f(x) = x \quad \text{and} \quad g(x) = |x|$$

$$\text{Now, } g \circ f(x) = g(f(x)) = g(x)$$

$$\therefore g \circ f(x) = |x|$$

$$\text{and, } f \circ g(x) = f(g(x)) = f(|x|)$$

$$\therefore f \circ g(x) = |x|$$

Functions Ex2.2 Q1(v)

$$f(x) = x^2 + 2x - 3 \quad \text{and} \quad g(x) = 3x - 4$$

$$\text{Now, } g \circ f(x) = g(f(x)) = g(x^2 + 2x - 3)$$

$$\therefore g \circ f(x) = 3(x^2 + 2x - 3) - 4$$

$$\Rightarrow g \circ f(x) = 3x^2 + 6x - 13$$

$$\text{and, } f \circ g(x) = f(g(x)) = f(3x - 4)$$

$$\begin{aligned} \therefore f \circ g(x) &= (3x - 4)^2 + 2(3x - 4) - 3 \\ &= 9x^2 + 16 - 24x + 6x - 8 - 3 \end{aligned}$$

$$\therefore f \circ g(x) = 9x^2 - 18x + 5$$

$$f(x) = 8x^3 \quad \text{and} \quad g(x) = x^{1/3}$$

$$\begin{aligned} \text{Now, } g \circ f(x) &= g(f(x)) = g(8x^3) \\ &= (8x^3)^{1/3} \end{aligned}$$

$$\therefore g \circ f(x) = 2x$$

$$\begin{aligned} \text{and, } f \circ g(x) &= f(g(x)) = f(x^{1/3}) \\ &= 8(x^{1/3})^3 \end{aligned}$$

$$\therefore f \circ g(x) = 8x$$

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