Functions Ex2.2 Q2

Let $f = \{(3,1),(9,3),(12,4)\}$ and

$g = \{(1,3),(3,3),(4,9),(5,9)\}$

Now,

range of $f = \{1, 3, 4\}$

domain of $f = \{3, 9, 12\}$

range of $g = \{3, 9\}$

domain of $g = \{1, 3, 4, 5\}$

since, range of $f \subset$ domain of $g$

$\therefore \quad g \circ f$ in well defined.

Again, range of $g \subseteq$ domain of $f$

$\therefore \quad f \circ g$ in well defined.

Now $g \circ f = \{(3,3),(9,3),(12,9)\}$

$f \circ g = \{(1,1),(3,1)(4,3),(5,3)\}$

Functions Ex2.2 Q3

We have,

$$f = \{(1,-1),(4,-2),(9,-3),(16,4)\} \text{ and}$$
$$g = \{(-1,-2),(-2,-4),(-3,-6),(4,8)\}$$

Now,

$$\text{Domain of } f = \{1,4,9,16\}$$
$$\text{Range of } f = \{-1,-2,-3,4\}$$
$$\text{Domain of } g = \{-1,-2,-3,4\}$$
$$\text{Range of } g = \{-2,-4,-6,8\}$$

Clearly range of $f$ = domain of $g$

$\therefore$ $g \circ f$ is defined.

but, range of $g \neq$ domain of $f$

$\therefore$ $f \circ g$ in not defined.

Now,

$$g \circ f(1) = g(-1) = -2$$
$$g \circ f(4) = g(-2) = -4$$
$$g \circ f(9) = g(-3) = -6$$
$$g \circ f(16) = g(4) = 8$$

$$\therefore \quad g \circ f = \{(1,-2),(4,-4),(9,-6),(16,8)\}$$

Functions Ex2.2 Q4

$A = \{a,b,c\}$, $B = \{u,v,w\}$ and

$f = A \to B$ and $g : B \to A$ defined by

$f = \{(a,v),(b,u),(c,w)\}$ and

$g = \{(u,b),(v,a),(w,c)\}$

For both f and g, different elements of domain have different images

$\therefore$ $f$ and $g$ are one-one

Again for each element in co-domain of f and g, there in a pre image in domain

$\therefore$ $f$ and $g$ are onto

Thus, $f$ and g are bijectives.

Now,

$$g \circ f = \{(a,a),(b,b),(c,c)\} \text{ and}$$
$$f \circ g = \{(u,u),(v,v),(w,w)\}$$

Functions Ex2.2 Q5

We have, $f : R \to R$ given by $f(x) = x^2 + 8$ and

$g : R \to R$ given by $g(x) = 3x^3 + 1$

$$\therefore \ f \circ g(x) = f(g(x)) = f(3x^3 + 1)$$
$$= (3x^3 + 1)^2 + 8$$

$$\therefore \ f \circ g(2) = (3 \times 8 + 1)^2 + 8 = 625 + 8 = 633$$

Again

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

$$\therefore \quad g \circ f(1) = 3(1 + 8)^3 + 1 = 2188$$

Functions Ex2.2 Q6

We have, $f : R^+ \to R^+$ given by

$f(x) = x^2$

$g : R^+ \to R^+$ given by

$g(x) = \sqrt{x}$

$$\therefore \quad f \circ g(x) = f(g(x)) = f(\sqrt{x}) = (\sqrt{x})^2 = x$$

Also,

$$g \circ f(x) = g(f(x)) = g(x^2) = \sqrt{x^2} = x$$

Thus,

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

Functions Ex2.2 Q7

We have, $f : R \to R$ and $g : R \to R$ are two functions defined by

$f(x) = x^2$ and $g(x) = x + 1$

Now,

$$f \circ g(x) = f(g(x)) = f(x + 1) = (x + 1)^2$$
$$\therefore f \circ g(x) = x^2 + 2x + 1 \ \ldots\ldots\ldots\ldots (i)$$
$$g \circ f(x) = g(f(x)) = g(x^2) = x^2 + 1 \ \ldots\ldots\ldots (ii)$$

from (i) & (ii)

$$f \circ g \neq g \circ f$$

*********** END **********