

Functions Ex 3.4 Q1

We have,

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

Now,

$$f+g:R \to R$$
 given by $(f+g)(x) = x^3 + x + 2$
 $f-g:R \to R$ given by $(f-g)(x) = x^3 + 1 - (x+1)$
 $= x^3 - x$
 $cf:R \to R$ given by $(cf)(x) = c(x^3 + 1)$
 $fg:R \to R$ given by $(fg)(x) = (x^3 + 1)(x + 1)$
 $= x^4 + x^3 + x + 1$
 $\frac{1}{f}:R - \{-1\} \to R$ given by $(\frac{1}{f})(x) = \frac{1}{x^3 + 1}$
 $\frac{f}{g}:R - \{-1\} \to R$ given by $(\frac{f}{g})(x) = \frac{(x+1)(x^2 - x + 1)}{x+1}$

We have,

$$f(x) = \sqrt{x-1}$$
 and $g(x) = \sqrt{x+1}$

Now,

$$f+g: (1,\infty) \to R \text{ defined by } (f+g)(x) = \sqrt{x-1} + \sqrt{x+1},$$

$$f-g: (1,\infty) \to R \text{ defined by } (f-g)(x) = \sqrt{x-1} - \sqrt{x+1},$$

$$cf: (1,\infty) \to R \text{ defined by } (cf)(x) = c\sqrt{x-1},$$

$$fg: (1,\infty) \to R \text{ defined by } (fg)(x) = (\sqrt{x-1})(\sqrt{x+1})$$

$$= \sqrt{x^2-1}$$

$$\frac{1}{f}: (1,\infty) \to R \text{ defined by } \left(\frac{1}{f}\right)(x) = \frac{1}{\sqrt{x-1}}$$

$$\frac{f}{g}: (1,\infty) \to R \text{ defined by } \left(\frac{f}{g}\right)(x) = \sqrt{\frac{x-1}{x+1}}$$

Functions Ex 3.4 Q2

We have.

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

We observe that f(x) = 2x + 5 is defined for all $x \in R$.

So, domain(f) = R

Clearly $g(x) = x^2 + x$ is defined for all $x \in R$

So, domain (g) = R

 \therefore Domain(f) \land Domain(g) = R

(i) Clearly,
$$(f+g): R \to R$$
 is given by $(f+g)(x) = f(x) + g(x)$
= $2x + 5 + x^2 + x$
= $x^2 + 3x + 5$

$$Domain(f+g) = R$$

(ii) We find that $f - g : R \to R$ is defined as

$$(f-g)(x) = f(x) - g(x)$$

$$= 2x + 5 - (x^2 + x)$$

$$= 2x + 5 - x^2 - x$$

$$= -x^2 + x + 5$$

$$Domain(f-g) = R$$

(iii) We find that $fg: R \to R$ is given by

$$(fg)(x) = f(x) \times g(x)$$

$$= (2x + 5) \times (x^2 + x)$$

$$= 2x^3 + 2x^2 + 5x^2 + 5x$$

$$= 2x^3 + 7x^2 + 5x$$

Domain(fg) = R

(iv) We have,

$$g(x) = x^{2} + x$$

$$f(x) = 0 \Rightarrow x^{2} + x = 0$$

$$\Rightarrow x(x+1) = 0$$

$$\Rightarrow x = 0 \text{ or, } x = -1$$

So,
$$\operatorname{domain}\left(\frac{f}{g}\right) = \operatorname{domain}\left(f\right) \cap \operatorname{domain}\left(g\right) - \left\{x : g\left(x\right) = 0\right\}$$
$$= R - \left\{-\phi, 0\right\}$$

We find that,
$$\frac{f}{g}: R - \{-1, 0\} \to R$$
 is given by $\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)} = \frac{2x + 5}{x^2 + x}$

$$D \text{ om ain } \left(\frac{f}{a}\right) = R - \{-1, 0\}$$

We have,

$$f(x) = \begin{cases} -1, & -2 \le x \le 0 \\ x - 1, & 0 < x \le 2 \end{cases}$$

Now,

$$f(|x|) = |x| - 1$$
, where $-2 \le x \le 2$

and
$$|f(x)| = \begin{cases} 1, & -2 \le x \le 0 \\ -(x-1), & 0 \le x \le 1 \\ (x-1), & 1 \le x \le 2 \end{cases}$$

$$g(x) = f(|x|) + |f(x)|$$

$$= \begin{cases} -x & -2 \le x \le 0 \\ 0, & 0 < x < 1 \\ 2(x-1), & 1 \le x \le 2 \end{cases}$$

******* FND *******