Increasing and Decreasing Functions Ex 17.2 Q26

We have,

$$f(x) = \log(1+x) - \frac{x}{1+x}$$

$$\therefore \quad f'(x) = \frac{1}{1+x} - \left(\frac{(1+x)-x}{(1+x)^2}\right)$$

$$= \frac{1}{1+x} - \frac{1}{(1+x)^2}$$

$$= \frac{x}{(1+x)^2}$$

Critical points

$$f'(x) = 0$$

$$\Rightarrow \quad \frac{x}{(1+x)^2} = 0$$

$$\Rightarrow \quad x = 0, \ -1$$

Clearly, $f'(x) > 0$ if $x > 0$

and $f'(x) < 0$ if $-1 < x < 0$ or $x < -1$

Hence, $f(x)$ increases in $(0, \infty)$, decreases in $(-\infty, -1) \cup (-1, 0)$.

Increasing and Decreasing Functions Ex 17.2 Q27

We have,

$$f(x) = (x+2)e^{-x}$$

$$\therefore \quad f'(x) = e^{-x} - e^{-x}(x+2)$$

$$= e^{-x}(1-x-2)$$

$$= -e^{-x}(x+1)$$

Critical points

$$f'(x) = 0$$

$$\Rightarrow \quad -e^{-x}(x+1) = 0$$

$$\Rightarrow \quad x = -1$$

Clearly, $f'(x) > 0$ if $x < -1$

$f'(x) < 0$ if $x > -1$

Hence, $f(x)$ increases in $(-\infty, -1)$, decreases in $(-1, \infty)$

.

Increasing and Decreasing Functions Ex 17.2 Q28

We have,

$$f(x) = 10^x$$

$$\therefore \quad f'(x) = 10^x \times \log 10$$

Now,

$$x \in R$$

$$\Rightarrow \quad 10^x > 0$$

$$\Rightarrow \quad 10^x \log 10 > 0$$

$$\Rightarrow \quad f'(x) > 0$$

Hence, $f(x)$ in an increasing function for all x.

Increasing and Decreasing Functions Ex 17.2 Q29

We have,

$$f(x) = x - [x]$$

$$\therefore \quad f'(x) = 1 > 0$$

$\therefore$ $f(x)$ in an increasing function on $(0, 1)$.

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