Increasing and Decreasing Functions Ex 17.2 Q6

We have,

$$f(x) = \log_a x, \quad 0 < a < 1$$

$$\Rightarrow \quad f'(x) = \frac{1}{x \log a}$$

$$\therefore \quad 0 < a < 1$$

$$\Rightarrow \quad \log a < 0$$

Now,

$$x > 0$$

$$\Rightarrow \quad \frac{1}{x} > 0$$

$$\Rightarrow \quad \frac{1}{x \log a} < 0$$

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

Thus, $f(x)$ is a decreasing function for $x > 0$.

Increasing and Decreasing Functions Ex 17.2 Q7

The given function is $f(x) = \sin x$.

$\therefore f'(x) = \cos x$

(a) Since for each $x \in \left(0, \frac{\pi}{2}\right)$, $\cos x > 0$, we have $f'(x) > 0$.

Hence, f is strictly increasing in $\left(0, \frac{\pi}{2}\right)$.

(b) Since for each $x \in \left(\frac{\pi}{2}, \pi\right)$, $\cos x < 0$, we have $f'(x) < 0$.

Hence, f is strictly decreasing in $\left(\frac{\pi}{2}, \pi\right)$.

(c) From the results obtained in (a) and (b), it is clear that f is neither increasing nor decreasing in $(0, \pi)$.

Increasing and Decreasing Functions Ex 17.2 Q8

We have,

$$f(x) = \log \sin x$$

$$\therefore f'(x) = \frac{1}{\sin x}\cos x = \cot x$$

$$\text{In interval}\left(0, \frac{\pi}{2}\right), f'(x) = \cot x > 0.$$

$$\therefore f \text{ is strictly increasing in}\left(0, \frac{\pi}{2}\right).$$

$$\text{In interval}\left(\frac{\pi}{2}, \pi\right), f'(x) = \cot x < 0.$$

$$\therefore f \text{ is strictly decreasing in}\left(\frac{\pi}{2}, \pi\right).$$

Increasing and Decreasing Functions Ex 17.2 Q9

We have,

$f(x) = x - \sin x$

$\therefore \quad f'(x) = 1 - \cos x$

Now,

$x \in R$

$\Rightarrow \quad -1 < \cos x < 1$

$\Rightarrow \quad -1 > \cos x > 0$

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

Hence, $f(x)$ is increasing for all $x \in R$.

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