Increasing and Decreasing Functions Ex 17.1 Q1

Let $x_1,\ x_2 \in (0, \infty)$

We have,

$$x_1 < x_2$$

$$\Rightarrow \quad \log_e x_1 < \log_e x_2$$

$$\Rightarrow \quad f(x_1) < f(x_2)$$

So, $f(x)$ is increasing in $(0, \infty)$.

Increasing and Decreasing Functions Ex 17.1 Q2

Case I

When $a > 1$

Let $x_1, x_2 \in (0, \infty)$

We have

$$x_1 < x_2$$

$$\Rightarrow \quad \log_a x_1 < \log_a x_2$$

$$\Rightarrow \quad f(x_1) < f(x_2)$$

Thus, $f(x)$ is increasing on $(0, \infty)$

Case II

When $0 < a < 1$

$$f(x) = \log_a x = \frac{\log x}{\log a}$$

When $a < 1 \Rightarrow \log a < 0$

Let $x_1 < x_2$

$$\Rightarrow \quad \log x_1 < \log x_2$$

$$\Rightarrow \quad \frac{\log x_1}{\log a} > \frac{\log x_2}{\log a} \qquad [\because \log a < 0]$$

$$\Rightarrow \quad f(x_1) > f(x_2)$$

So, $f(x)$ is decreasing on $(0, \infty)$.

Increasing and Decreasing Functions Ex 17.1 Q3

We have,

$$f(x) = ax + b, \ a > 0$$

Let $x_1, x_2 \in R$ and $x_1 > x_2$

$\Rightarrow \quad ax_1 > ax_2$ for some $a > 0$

$\Rightarrow \quad ax_1 + b > ax_2 + b$ for some b

$\Rightarrow \quad f(x_1) > f(x_2)$

$\therefore \quad f(x)$ is increasing function of R.

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