Increasing and Decreasing Functions Ex 17.1 Q7

We have,

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

Case I

When $x \in [0, \infty)$

Let $x_1 > x_2$

$$\Rightarrow \quad x_1^2 > x_2^2$$

$$\Rightarrow \quad 1 + x_1^2 > 1 + x_2^2$$

$$\Rightarrow \quad \frac{1}{1+x_1^2} < \frac{1}{1+x_2^2}$$

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

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

Case II

When $x \in (-\infty, 0]$

Let $x_1 > x_2$

$$\Rightarrow \quad x_1^2 < x_2^2$$

$$\Rightarrow \quad 1 + x_1^2 < 1 + x_2^2$$

$$\Rightarrow \quad \frac{1}{1+x_1^2} > \frac{1}{1+x_2^2}$$

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

So, $f(x)$ is increasing on $(-\infty, 0]$

Thus, $f(x)$ is neither increasing nor decreasing on R.

Increasing and Decreasing Functions Ex 17.1 Q8

We have,

$$f(x) = |x| = \begin{cases} x, & x > 0 \\ -x, & x < 0 \end{cases}$$

(a)

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

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

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

(b)

Let $x_1, x_2 \in (-\infty, 0)$ and $x_1 > x_2$

$\Rightarrow \quad -x_1 < -x_2$

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

$\therefore \quad f(x)$ is strictly decreasing on $(-\infty, 0)$.

Increasing and Decreasing Functions Ex 17.1 Q9

$$f(x) = 7x - 3$$

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

$\Rightarrow \quad 7x_1 > 7x_2$

$\Rightarrow \quad 7x_1 - 3 > 7x_2 - 3$

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

$\therefore \quad f(x)$ is strictly increasing on R.

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