

Increasing and Decreasing Functions Ex 17.2 Q1(xxvi)

Consider the given function

$$f(x)=3x^4-4x^3-12x^2+5$$

$$\Rightarrow f'(x) = 12x^3 - 12x^2 - 24x$$

$$\Rightarrow f'(x) = 12x(x^2 - x - 2)$$

$$\Rightarrow f'(x) = 12x(x+1)(x-2)$$

For f(x) to be increasing, we must have,

$$f^{+}(x) > 0$$

$$\Rightarrow$$
 12x (x + 1)(x - 2) > 0

$$\Rightarrow x(x+1)(x-2) > 0$$

$$\Rightarrow -1 < x < 0 \text{ or } 2 < x < \infty$$

$$\Rightarrow x \in (-1, 0) \cup (2, \infty)$$

So, f(x)is increasing in $(-1,0) \cup (2,\infty)$

For f(x) to be decreasing, we must have,

$$\Rightarrow 12x(x+1)(x-2)<0$$

$$\Rightarrow x(x+1)(x-2)<0$$

$$\Rightarrow -\infty < x < -1 \text{ or } 0 < x < 2$$

$$\Rightarrow \times \in \left(-\infty,-1\right) \cup \left(0,2\right)$$

So, f(x)is decreasing in $(-\infty, -1) \cup (0,2)$

Increasing and Decreasing Functions Ex 17.2 Q1(xxvii)

Consider the given function

$$f(x) = \frac{3}{2}x^4 - 4x^3 - 45x^2 + 51$$

$$\Rightarrow f'(x) = 4 \times \frac{3}{2} x^3 - 12x^2 - 90x$$

$$\Rightarrow f'(x) = 6x^3 - 12x^2 - 90x$$

$$\Rightarrow f'(x) = 6x(x^2 - 2x - 15)$$

$$\Rightarrow f'(x) = 6x(x+3)(x-5)$$

For f(x) to be increasing, we must have,

$$\Rightarrow$$
 6x (x + 3)(x - 5) > 0

$$\Rightarrow x(x+3)(x-5) > 0$$

$$\Rightarrow$$
 -3 < x < 0 or 5\infty

$$\Rightarrow \times \in (-3, 0) \cup (5, \infty)$$

So, f(x)is increasing in $(-3,0) \cup (5,\infty)$

For f(x) to be decreasing, we must have,

$$\Rightarrow$$
 6x (x + 3)(x - 5) < 0

$$\Rightarrow x(x+3)(x-5)<0$$

$$\Rightarrow$$
 - ∞

$$\Rightarrow \times \in (-\infty, -3) \cup (0, 5)$$

So,
$$f(x)is$$
 decreasing in $(-\infty, -3) \cup (0,5)$

Increasing and Decreasing Functions Ex 17.2 Q1(xxviii)

Consider the given function

$$f(x) = \log (2+x) - \frac{2x}{2+x}, x \in \mathbb{R}$$

$$\Rightarrow f'(x) = \frac{1}{2+x} - \frac{(2+x)^2 - 2x \times 1}{(2+x)^2}$$

$$\Rightarrow f'(x) = \frac{1}{2+x} - \frac{4+2x-2x}{(2+x)^2}$$

$$\Rightarrow f'(x) = \frac{1}{2+x} - \frac{4}{(2+x)^2}$$

$$\Rightarrow f'(x) = \frac{2+x-4}{(2+x)^2}$$

$$\Rightarrow f'(x) = \frac{x-2}{(2+x)^2}$$

For f(x) to be increasing, we must have,

$$\Rightarrow x - 2 > 0$$

$$\Rightarrow x \in (2, \infty)$$

So, $f(x)i \sin crea \sin g$ in $(2, \infty)$

For f(x) to be decreasing, we must have,

$$\Rightarrow x - 2 < 0$$

$$\Rightarrow$$
 - ∞ < \times < 2

$$\Rightarrow x \in (-\infty, 2)$$

So, f(x) is decreasing in $(-\infty, 2)$

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