Increasing and Decreasing Functions Ex 17.2 Q1(v)

We have,

$$f(x) = 5 + 36x + 3x^2 - 2x^3$$

$$\therefore \quad f'(x) = 36 + 6x - 6x^2$$

Critical point

$$f'(x) = 0$$

$$\Rightarrow \quad 36 + 6x - 6x^2 = 0$$

$$\Rightarrow \quad -6\left(x^2 - x - 6\right) = 0$$

$$\Rightarrow \quad (x - 3)(x + 2) = 0$$

$$\therefore \quad x = 3, \quad -2$$

Clearly, $f'(x) > 0$ if $-2 < x < 3$

Also $f'(x) < 0$ if $x < -2$ and $x > 3$

Thus, increases if $x \in (-2, 3)$, decreases if $x \in (-\infty, -2) \cup (3, \infty)$

Increasing and Decreasing Functions Ex 17.2 Q1(vi)

We have,

$$f(x) = 8 + 36x + 3x^2 - 2x^3$$

$$\therefore \quad f'(x) = 36 + 6x - 6x^2$$

Critical points

$$f'(x) = 0$$

$$\Rightarrow \quad 6\left(6 + x - x^2\right) = 0$$

$$\Rightarrow \quad (3 - x)(2 + x) = 0$$

$$\Rightarrow \quad x = 3, \quad -2$$

Clearly, $f'(x) > 0$ if $-2 < x < 3$

and $f'(x) < 0$ if $-\infty < x < -2$ and $3 < x < \infty$

Thus, increases in $(-2, 3)$, decreases in $(-\infty, -2) \cup (3, \infty)$

Increasing and Decreasing Functions Ex 17.2 Q1(vii)

We have,

$$f(x) = 5x^3 - 15x^2 - 120x + 3$$

$$\therefore \quad f'(x) = 15x^2 - 30x - 120$$

Critical points

$$f'(x) = 0$$

$$\Rightarrow \quad 15(x^2 - 2x - 8) = 0$$

$$\Rightarrow \quad (x-4)(x+2) = 0$$

$$\Rightarrow \quad x = 4, \ -2$$

Clearly, $f'(x) > 0$ if $x < -2$ and $x > 4$

and $f'(x) < 0$ if $-2 < x < 4$

Thus, increases in $(-\infty, -2) \cup (4, \infty)$, decreases in $(-2, 4)$

Increasing and Decreasing Functions Ex 17.2 Q1(viii)

$$f(x) = x^3 - 6x^2 - 36x + 2$$

$$\therefore \quad f'(x) = 3x^2 - 12x - 36$$

Critical point

$$f'(x) = 0$$

$$\Rightarrow \quad 3(x^2 - 4x - 12) = 0$$

$$\Rightarrow \quad (x-6)(x+2) = 0$$

$$\Rightarrow \quad x = 6, \ -2$$

Clearly, $f'(x) > 0$ if $x < -2$ and $x > 6$

$f'(x) < 0$ if $-2x < x < 6$

Thus, increases in $(-\infty, -2) \cup (6, \infty)$, decreases in $(-2, 6)$.

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