



Increasing and Decreasing Functions Ex 17.2 Q1(v)

We have,

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

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

Critical point

$$f'(x) = 0$$

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

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

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

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

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,

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

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

Critical points

$$f'(x) = 0$$

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

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

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

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,

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

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

Critical points

$$f'(x) = 0$$

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

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

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

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)

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

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

Critical point

$$f'(x) = 0$$

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

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

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

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

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

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

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