

27/10/23
30/10/23

Q Find the critical point on what interval (day 32)
this f is increasing, decreasing, local maximum,
local minimum and concavity and inflection
point. $f(x) = 2x^3 + 3x^2 - 36x$

Soln: Given:

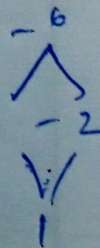
$$f(x) = 2x^3 + 3x^2 - 36x$$

• Step 1 Critical point

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

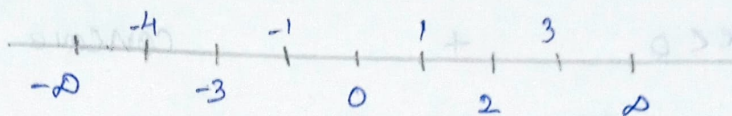
$$f'(x) = 0 \Rightarrow 6x^2 + 6x - 36 = 0$$

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



$$x = -3; x = 2$$

The critical points are $-3, 2$



Step: 2 To find increasing & decreasing function.

Interval	Sign of f'	Behaviour of f
$-\infty < x < -3$	+	Increasing
$-3 < x < 0$	-	Decreasing
$0 < x < 2$	-	Decreasing
$2 < x < \infty$	+	Increasing

Step: 3 To find local maxima & local minima.

Put $x = -3$

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

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

$$= 81 \text{ local maxima}$$

Put $x = 2$

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

$$= -44 \text{ local minimum.}$$

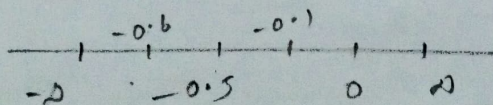
Step 4: Concave up & Concave down (Concavity)

$$f''(x) = 12x + 6$$

$$f''(x) = 0$$

($\div 6$) $2x + 1 = 0$

$$2x = -1 \Rightarrow x = -1/2 \Rightarrow x = -0.5$$



Interval	Sign of f''	Behaviour of f
$-1 < x < -0.5$	-	Concave down
$-0.5 < x < 0$	+	Concave up

Step: 5 To find inflection point

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

$$\begin{aligned} f(-0.5) &= 2(-0.5)^3 + 3(-0.5)^2 - 36(-0.5) \\ &= 18.5 \end{aligned}$$

\therefore The inflection point is 18.5