

Question 7**Problem:**

Let $f(x) = x^3 - 3x^2 + 1$ on the interval $[0, 4]$.

- (a) Find all critical points of $f(x)$ in the interval.
- (b) Determine the absolute maximum and minimum values of $f(x)$ on the given interval.

Question 7 - Solution

(a) Find critical points:

Differentiate:

$$f'(x) = 3x^2 - 6x = 3x(x - 2)$$

Set $f'(x) = 0$ to find critical points:

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

(b) Evaluate function at critical points and endpoints:

$$f(0) = 0^3 - 3(0)^2 + 1 = 1$$

$$f(2) = 8 - 12 + 1 = -3$$

$$f(4) = 64 - 48 + 1 = 17$$

Conclusion:- Absolute maximum: $\boxed{17}$ at $x = 4$ - Absolute minimum: $\boxed{-3}$ at $x = 2$ **Graph of** $f(x) = x^3 - 3x^2 + 1$ on $[0, 4]$: