

Question 9

Evaluate the limit:

$$\lim_{x \rightarrow -\infty} \frac{2x^3 + x^2 - 5}{x^3 - 4x + 1}$$

Question 9 - Solution

We are given:

$$\lim_{x \rightarrow -\infty} \frac{2x^3 + x^2 - 5}{x^3 - 4x + 1}$$

Step 1: Factor out the highest power of x (which is x^3) from both numerator and denominator:

$$= \lim_{x \rightarrow -\infty} \frac{x^3 \left(2 + \frac{1}{x} - \frac{5}{x^3}\right)}{x^3 \left(1 - \frac{4}{x^2} + \frac{1}{x^3}\right)}$$

Cancel the common x^3 terms:

$$= \lim_{x \rightarrow -\infty} \frac{2 + \frac{1}{x} - \frac{5}{x^3}}{1 - \frac{4}{x^2} + \frac{1}{x^3}}$$

Step 2: Take the limit as $x \rightarrow -\infty$. All terms with $\frac{1}{x^n} \rightarrow 0$:

$$= \frac{2 + 0 - 0}{1 - 0 + 0} = \boxed{2}$$