

Question 7

Evaluate the limit:

$$\lim_{x \rightarrow -\infty} \frac{5x^3 + x^2 - 7x + 1}{-2x^3 + 3x - 9}$$

Question 7 - Solution

We are given:

$$\lim_{x \rightarrow -\infty} \frac{5x^3 + x^2 - 7x + 1}{-2x^3 + 3x - 9}$$

Step 1: Factor out the highest degree of x from both numerator and denominator:

$$= \lim_{x \rightarrow -\infty} \frac{x^3 \left(5 + \frac{1}{x} - \frac{7}{x^2} + \frac{1}{x^3} \right)}{x^3 \left(-2 + \frac{3}{x^2} - \frac{9}{x^3} \right)}$$

Cancel the common factor of x^3 :

$$= \lim_{x \rightarrow -\infty} \frac{5 + \frac{1}{x} - \frac{7}{x^2} + \frac{1}{x^3}}{-2 + \frac{3}{x^2} - \frac{9}{x^3}}$$

Step 2: Let $x \rightarrow -\infty$. All terms with negative powers vanish:

$$= \frac{5 + 0 - 0 + 0}{-2 + 0 - 0} = \boxed{-\frac{5}{2}}$$