

1. If the polynomial $q(x)$ in the denominator is of higher order, then $\lim_{x \rightarrow \pm\infty} \frac{p(x)}{q(x)} = \underline{\hspace{2cm}}$

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

2. If the polynomial $p(x)$ in the numerator is of higher order, then $\lim_{x \rightarrow \pm\infty} \frac{p(x)}{q(x)} = \underline{\hspace{2cm}}$

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

3. If the polynomials $p(x)$ and $q(x)$ are of the same order, then $\lim_{x \rightarrow \pm\infty} \frac{p(x)}{q(x)} = \underline{\hspace{2cm}}$

$$\text{Ex } \lim_{x \rightarrow \infty} \frac{ax^3 - 4x^2 - x}{bx^3 + 2x - 5} = \lim_{x \rightarrow \infty} \frac{x^3 \left(a - \frac{4}{x} - \frac{1}{x^2} \right)}{x^3 \left(b + \frac{2}{x^2} - \frac{5}{x^3} \right)} = \lim_{x \rightarrow \infty} \frac{a - \frac{4}{x} - \frac{1}{x^2}}{b + \frac{2}{x^2} - \frac{5}{x^3}} =$$

(a). $\lim_{x \rightarrow \infty} \frac{x - 3x^2}{x^3 + 1}$

(b). $\lim_{x \rightarrow \infty} \frac{x^2 - x + 1}{2x^2 + 1}$

(c). $\lim_{x \rightarrow -\infty} \frac{1 + 2x + 4x^3}{3x - 2x^3}$

(d). $\lim_{x \rightarrow \infty} \frac{2x^3 + 5}{3x^2 + 1}$

(e). $\lim_{x \rightarrow \infty} \frac{\sqrt{3x^2 - 2x}}{x - 1}$

(f). $\lim_{x \rightarrow 0} \frac{3x^3 + 2x - 5}{x^3 + 7x + 1}$