Limits at Infinity

Infinity (∞) is **not a position on the number line.** Rather, it is a **concept** of a number continuing to get larger and larger without any limit. With that in mind, consider the problem:

$$\lim_{x\to\infty} \frac{3x^2}{x^2+5}$$

What happens if we try to "substitute in ∞" (which is illegal since ∞ is not a number)? We would illegally obtain the following:

$$\frac{3\infty^2}{\infty^2+5} = \frac{\infty}{\infty}$$

Example 1: $\lim_{x \to \infty} \frac{3x^2}{x^2 + 5} = ?$

Example 2: $\lim_{x \to \infty} \frac{7x^2 - 2x}{4x^3 - x} = ?$

Example 3: $\lim_{x \to \infty} (x^3 - 6x^2 + x) = ?$

Example 4: $\lim_{x \to -\infty} (11x^2 - 2x^3 + x) = ?$

Group Practice

1. $\lim_{x \to \infty} \frac{x+5}{x-2} = ?$

2. $\lim_{x \to \infty} \frac{5x^3+2}{20x^3-6x}$

Group Practice

3. $\lim_{x \to \infty} \frac{5 + 2^x}{15 - 6x}$

4. $\lim_{x \to \infty} (7 - 11x^2 - 6x^5)$

Group Practice

5. $\lim_{x \to \infty} 6^x = ?$

6. $\lim_{x \to \infty} \dfrac{9x^4 - x^3 + 1}{x - 2x^4}$

Group Practice

7. $\lim_{x \to -\infty} (12x^4 - x^3 + 7x^2 + 1)$

8. $\lim_{x \to \infty} (7 - \frac{1}{x} + \frac{1}{x^2})$