

Calculus BC

Section 3.5 - Limits at Infinity

Obj: -To determine limits at infinity

-To find horizontal asymptotes of the graph of a function

Definition of a Horizontal Asymptote

The line $y = L$ is a horizontal asymptote of $f(x)$ if

$$\lim_{x \rightarrow -\infty} f(x) = L \quad \text{or} \quad \lim_{x \rightarrow \infty} f(x) = L$$

1. Find $\lim_{x \rightarrow \infty} \frac{3x+1}{2x-1}$

-apply $x = \infty$ will result in $\frac{\infty}{\infty}$ which is an **indeterminate form**

-can reduce the fraction by dividing both numerator and denominator by _____

-simplify

-take the limit

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

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

4. Evaluate

a) $\lim_{x \rightarrow \infty} \frac{2x - 1}{\sqrt{5x^2 + 1}}$

-divide numerator and denominator by _____

for $x > 0$, $\sqrt{x^2} =$

b) $\lim_{x \rightarrow -\infty} \frac{2x-1}{\sqrt{5x^2+1}}$

-divide numerator and denominator by _____
for $x < 0$, $\sqrt{x^2} =$

5. Evaluate

a) $\lim_{x \rightarrow \infty} \frac{\cos x}{x}$

b) $\lim_{x \rightarrow \infty} \sin x$

6. Evaluate $\lim_{x \rightarrow \infty} \frac{2x^2 - 3x}{x+1}$