Course Number
Instructor
Date

Section 12.4 Limits at Infinity and Limits of Sequences

Objective: In this lesson you learned how to evaluate limits at infinity and find limits of sequences.

I. Limits at Infinity and Horizontal Asymptotes
(Pages 835–838)

What you should learn
How to evaluate limits of functions at infinity

Define **limits at infinity.**

If f is a function and L_1 and L_2 are real numbers, the statements $\lim_{x \to -\infty} f(x) = L_1$ and $\lim_{x \to \infty} f(x) = L_2$ denote the limits at infinity.

The first is read "the limit of $f(x)$ as x approaches $-\infty$ is L_1," and the second is read "the limit of $f(x)$ as x approaches ∞ is L_2."

To help evaluate limits at infinity, you can use the following:

If r is a positive real number, then $\lim_{x\to\infty} \frac{1}{x^r} =$ ____0____.

If x^r is defined when $x < 0$, then $\lim_{x\to-\infty} \frac{1}{x^r} =$ ____0____.

Example 1: Find the limit: $\lim_{x\to\infty} \frac{1+5x-3x^3}{x^3}$

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If $f(x)$ is a rational function and the limit of f is taken as x approaches ∞ or $-\infty$,

- When the degree of the numerator is less than the degree of the denominator, the limit is ____0____.
- When the degrees of the numerator and the denominator are equal, the limit is __the ratio of the coefficients of the highest-powered terms__.
- When the degree of the numerator is greater than the degree of the denominator, the limit __does not exist__.

II. Limits of Sequences (Pages 839–840)

What you should learn
How to find limits of sequences

For a sequence whose nth term is a_n, as n increases without bound, if the terms of the sequence get closer and closer to a particular value L, then the sequence is said to

____converge____ to L. Otherwise, the sequence is said to

____diverge____.

Give the definition of the limit of a sequence.

Let f be a function of a real variable, such that $\lim_{x \to \infty} f(x) = L$.

If $\{a_n\}$ is a sequence such that $f(n) = a_n$ for every positive integer n, then $\lim_{n \to \infty} a_n = L$.

Example 2: Find the limit of the sequence $a_n = \dfrac{(n-3)(4n-1)}{4-3n-n^2}$.

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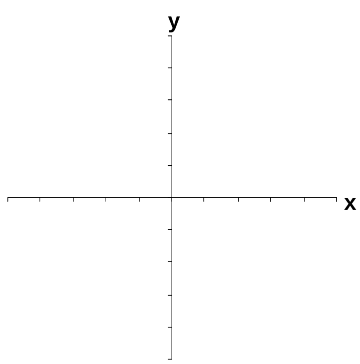

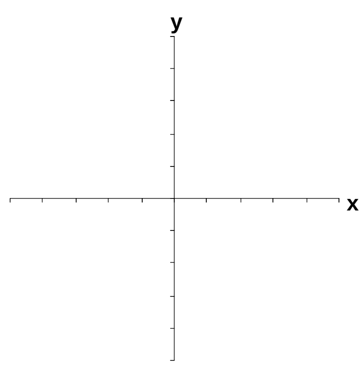

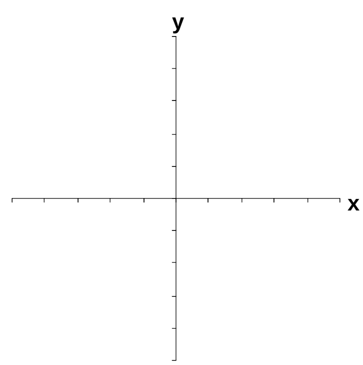

Homework Assignment

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