Math 146
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11.1: Infinite Sequences

Definition 1 Consider

$$a_1, a_2, \ldots, a_n, \ldots$$

an infinite *sequence* of terms. If $\lim_{n\to\infty} a_n = L$, then we say the sequence $\{a_n\}$ *converges* to L. If $\lim_{n\to\infty} a_n$ does not exist, then we say the sequence $\{a_n\}$ *diverges.*

(1) For each of the sequences below, write out the first ten terms of the sequence.

(a) $a_n = \dfrac{n+1}{3n-1}$

(b) $\left\{\dfrac{3(-1)^n}{n!}\right\}$

(2) Do either of the two sequences in the previous question converge? Why or why not?

(3) For each of the following sequences, determine if the sequence **converges** or **diverges**. If it converges, find the limit.

(a) $a_n = \dfrac{3+5n^2}{n+n^2}$

(b) $a_n = \dfrac{n^3}{n+1}$

(c) $a_n = \dfrac{3^{n+2}}{5^n}$

(d) $\left\{\dfrac{e^n + e^{-n}}{e^{2n-1}}\right\}$

(e) $\{n \sin(1/n)\}$

(f) $a_n = \left(1+\dfrac{1}{n}\right)^n$