8.1 Sequences

Goals

- Understand the idea of sequences
- Know and be able to use the definition of convergence for a sequence
- Know the properties of limits of convergent sequences
- Be able to find the limit of a convergent sequence using the definition; the Sandwich Theorem; continuous functions; and l’Hôpital’s rule

Problems

Determine whether the following sequences are convergent or divergent. If the sequence converges find its limit, otherwise state the manner in which it diverges.

1. \(a_n = \ln n - \ln(n+1)\)
2. \(a_n = \left(\frac{1}{3}\right)^n + \frac{1}{\sqrt[2]{n}}\)
3. \(a_n = \tan^{-1} n\)
4. \(a_n = \left(1 - \frac{1}{n}\right)^n\)
5. \(a_n = \ln \left[\left(1 - \frac{1}{n}\right)^n\right]\)
6. \(a_n = \frac{n!}{10^n}\)
7. \(a_n = \frac{n}{4^n}\)
8. \(a_n = \frac{\ln n}{n^{1/n}}\)
9. \(a_n = e^{-n} \cos n\)