Definition: The sequence \((s_n)\) is a Cauchy sequence if for every \(\epsilon > 0\) there exists \(N \in \mathbb{R}\) such that \(m, n > N\) implies \(|s_n - s_m| < \epsilon\).

1. Prove that a convergent sequence of real numbers is a Cauchy sequence.
2. Prove that the sequence \(s_n = (-1)^{n+1} \frac{n}{n+1}\) is not a Cauchy sequence. Conclude it is divergent.
3. Prove that a real-valued Cauchy sequence is bounded.
4. There is a theorem which states that every real-valued Cauchy sequence converges to a real number. Is it true that every rational-valued Cauchy sequence converges to a rational number? Justify your answer.