M 383: Assignment 4

Nathan Stouffer

Exercises 3.1.3 — Problem 1

Problem. Compute the sup, inf, limsup, liminf, and all the limit points of the sequence $x_1, x_2, ...$ where $x_n = 1/n + (-1)^n$.

Proof.

Exercises 3.1.3 — Problem 2

Problem. If a bounded sequence is the sum of a monotone increasin and a monotone decreasing sequence ($x_n = y_n + z_n$ where $\{y_n\}$ is monotone increasing and $\{z_n\}$ is monotone decreasing), does it follow that the sequence converges? What if $\{y_n\}$ and $\{z_n\}$ are bounded?

Proof.

Exercises 3.1.3 — Problem 4

Problem. Prove $\sup(A \cup B) \geq \sup A$ and $\sup(A \cap B) \leq \sup A$.

Proof.

Exercises 3.1.3 — Problem 6

Problem. Is every subsequence of a subsequence of a subsequence also a subsequence of the sequence?

Proof.

Exercises 3.1.3 — Problem 9

Problem. Can there exist a sequence whose set of limit points is exactly $1, 1/2, 1/3, ...$?

Proof.