

# REAL ANALYSIS OUTLINE

## Sequences.

- $\epsilon - N$  definition of convergence
- Cauchy criterion and Cauchy sequences
- Monotone Convergence Theorem
- Pinching Theorem
- Bolzano-Weierstraß

## Topology.

- Proving sets are open using the definition
- Proving sets are closed by using:
  - Definition (compliment of open sets)
  - Sequential characterization
  - Inverse image of closed set under continuous map
- Connected Sets (definition)
- Compact Sets
  - Characterization involving open covers
  - Characterization involving convergent subsequences
  - Heine-Borel (Closed and Bounded Characterization)
- Know the effects of set operations on open, closed and compact sets

## Continuity.

- The three Characterizations:
  - $\epsilon - \delta$  definition
  - Characterization using sequences
  - Topological (inverse image of open/closed sets idea)
- Continuous images of connected and compact sets
- Uniform continuity

## Sequences and Series of Functions.

- Pointwise versus uniform convergence
- Continuity of convergent sequences/series