An Introduction to Mathematical Reasoning with Applications to Induction and Contradiction Proofs

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Outline

1. What is a proof?
2. Proof by contradiction
3. Proof by induction
4. Conclusions

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A **theorem** is a statement that can be shown to be true.

- Hypothesis.
- Thesis.

Example

Bolzano's theorem: If f is a continuous function defined on a closed interval $[a, b]$ such that $sign(f(a)) \neq sign(f(b))$.
Then there exists a point c in the open interval (a, b) satisfying $f(c) = 0$.

- Hypothesis:
  - $f : [a, b] \to \mathbb{R}$ is continuous.
  - $sign(f(a)) \neq sign(f(b))$
- Thesis:
  - $\exists c \in (a, b) : f(c) = 0$

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Thank you!

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