Lecture Notes: Induction Proofs

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1 Overview

Key Points

- Key point 1
- Key point 2
- Key point 3

2 Detailed Notes

2.1 Proof by Condtradiction

To prove that a proposition P is true, we assume that P is false, formally determined as Not P is True. then use that hypothesis to derive a falsehood or condtradiction. If $\not P \Rightarrow$ F is true, the only way for this state ment to be true is if not P is false or otherwise if P is true.

2.2 Subtopic 2

Your notes for subtopic 2

3 Important Formulas/Theorems/Definitions

Key Formula/Theorem

State an important formula or theorem here

4 Examples

Proof that $\sqrt{2}$ is irrational
Assume, for the purpose of contradiction, that $\sqrt{2}$ is rational.

1. If $\sqrt{2}$ is rational, then $\sqrt{2} = \frac{a}{b}$ for some integers a and $b \neq 0$, with $\frac{a}{b}$ in lowest terms.
2. Squaring both sides: $2 = \frac{a^2}{b^2}$
3. Multiply both sides by b^2: $2b^2 = a^2$
4. Therefore, a^2 is even, which implies a is even.
5. Let $a = 2k$ for some integer k.
6. Substituting: $2b^2 = (2k)^2 = 4k^2$
7. Simplifying: $b^2 = 2k^2$
8. Therefore, b^2 is even, which implies b is even.
9. But if both a and b are even, the fraction $\frac{a}{b}$ is not in lowest terms.
10. This contradicts our initial assumption.
11. $\lightning$

Therefore, $\sqrt{2}$ cannot be expressed as a ratio of integers and is thus irrational.

5 Questions/Topics for Further Study

- Question or topic for further study