

Discrete Mathematics

Logic and Proof

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Proof by Contradiction

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Note that $\neg(p \rightarrow q) \equiv p \wedge \neg q$.

If we can prove $p \wedge \neg q$ is false, then $p \rightarrow q$ must be true.

Method of proof by contradiction. To prove $p \rightarrow q$, assume that $p \wedge \neg q$ and try to create a contradiction, i.e. something that is definitely false.

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Example 1

Prove: If there are 26 people, then at least 3 of them were born in the same month.

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Example 2

(This is the famous proof by Euclid on the existence of irrational numbers.)

Prove: $\sqrt{2}$ is an irrational number.