Proof – Negation of a Statement

How to Negate Different Types of Statements

1. Simple Statements

Often, you can negate a statement by adding "not" or changing equality to inequality.

- **Statement** : $x+2=7$
- **Negation** : $x+2\neq 7$

2. Inequalities

When negating inequalities, you must reverse the sign to include all possibilities that contradict the original.

- **Statement** : $x \geq 0$
- **Negation** : $x < 0$ (If x is not greater than or equal to 0, it must be less than 0).

3. Quantified Statements ("All" and "Some")

This is a critical area for A-Level. To negate, you change "all" to "some" and "some" to "all," and negate the final condition.

- **Universal** : "All cats purr" becomes "Some cats do not purr".
- **Existential** : "Some cars are fast" becomes "No cars are fast" (or "All cars are not fast").

4. Compound Statements ("And" and "Or")

- **Negation of (A and B):** "Not A **or** Not B".
  - *Example:* "The number is even and divisible by 3" → "The number is odd or not divisible by 3".
- **Negation of (A or B):** "Not A **and** Not B".
  - *Example:* "It is sunny or it is hot" → "It is not sunny and it is not hot".

5. Conditional Statements ("If A, then B")

To negate "If A, then B," you must show that A happens, but B does not happen (A and not B).

- **Statement:** "If it is raining, I will take an umbrella."
- **Negation:** "It is raining and I did not take an umbrella".