(ii) An argument does not depend on the truth of the premises or the conclusion but it just interested only in the question "**Is the conclusion implied by the conjunction of the premises?**"

1.10. Mathematical Proof

In this section some common procedures of proofs in mathematics are given with examples.

1.10.1 To Prove Statement of Type (p → q).
(1) Rule of conditional proof.
Let p is true statement and $s_1, s_2, \dots, s_n$ all previous axioms and theorems. To prove p → q it is enough to prove

$$s_1, s_2, \dots, s_n, p \mapsto q$$

is valid argument.

Example 1.10.2. Prove that, a is an even number → a^2 is an even number.
Proof.
Suppose a is an even number.
(1) $a = 2k$, k is an integer (definition of even number).
(2) $a^2 = 4k^2$, square both sides of (1)
(3) $a^2 = 2(2k^2)$,
(4) a^2 is even number, since $2k^2$ is an integer and definition of even number.

Note that the above prove the tautology

$$(s_1 \wedge s_2 \wedge p) \rightarrow q$$

where
p: a is an even number
s_1: $a = 2k$,
s_2: $a^2 = 4k^2$,
q: a^2 is even number.

(2) Contrapositive
To prove p → q we can proof that (~ q → ~p) since (p → q) ≡ (~ q → ~p).

Example 1.10.3. Prove that, $a^2$is an even number → a is an even number.
Proof.
Let p: $a^2$is an even number,