Class 11

Important Formulas

Mathematical Reasoning

1. A sentence is called a mathematically acceptable statement or simply a statement if it is either true or false but not both.
2. The denial of a statement is called negation of the statement. The negation of a statement p is denoted by $\sim p$ and is read as "not p".
3. A statement is called a compound statement if it is made up of two or more simple statements. The simple statements are called component statements of the compound statement.
4. Compound statements are obtained by using connecting words like "and", "or" etc and phrases "If-then", "Only if", "if and only if", "There exists", "For all" etc.
5. The compound statement with "AND" is
   (i) true if all its component statements are true.
   (ii) false if any of its component statements is false.
6. The compound statement with "OR" is
   (i) true when one component statement is true or both the component statements are true.
   (ii) false when both the component statements are false.
7. A sentence with "If p, then q" can be written in the following ways:
   (i) p implies q (denoted by $p \Rightarrow q$)
   (ii) p is sufficient condition for q
   (iii) q is necessary condition for p
   (iv) p only if q
   (v) $\sim q$ implies $\sim p$
8. (i) The contrapositive of the statement $p \Rightarrow q$ is the statement $\sim q \Rightarrow \sim p$.
   (ii) The converse of the statement $p \Rightarrow q$ is the statement $q \Rightarrow p$.
   (iii) The inverse of the statement $p \Rightarrow q$ is the statement $\sim p \Rightarrow \sim q$.
9. For all or for every is called universal quantifier. There exists is called existential quantifier.
10. A statement is said to valid or invalid according as it is true or false.
11. If p and q are two mathematical statements, then the statement
    (i) "p and q" is true if both p and q are true.
    (ii) "p or q" is true if p is false $\Rightarrow q$ is true or, q is false $\Rightarrow p$ is true.
    (iii) "If p, then q" is true if
    (a) p is true $\Rightarrow$ q is true
    or (b) q is false $\Rightarrow$ p is false
    or (c) p is true and q is false leads us to a contradiction.
    (iv) "p if and only if q" is true, if
    (a) p is true $\Rightarrow$ q is true
    and (b) q is true $\Rightarrow$ p is true.