1. Show that
   
   (a) \((p \rightarrow q) \rightarrow r\) and \(p \rightarrow (q \rightarrow r)\) are not equivalent.
   
   (b) \((p \rightarrow q) \land (p \rightarrow r)\) and \(p \rightarrow (q \land r)\) are logically equivalent.

   **Answer:**

2. Given the statement “If \(2^n - 1\) is prime then \(2^{n-1}(2^n - 1)\) is perfect number” where the domain is all positive integers. First, express the statement using quantifiers and logical connectives. Then, write
   
   (a) Contrapositive;
   
   (b) Converse;
   
   (c) Inverse;

   of the above statement.
3. How do the proofs of the following statements start?
   (a) “The set of real numbers is uncountable” when you give proof by contradiction.
   (b) “If $2^n - 1$ is prime then $2^{n-1}(2^n - 1)$ is perfect number” when you give a direct proof.

   Answer:

4. Translate each of the statement into logical expressions using predicates, quantifiers, and logical connectives
   (a) No one is perfect.
   (b) Not every one is perfect.
   (c) All your friends are perfect.

   Answer:
5. Use set builder notation and logical equivalences to show that if \(A\) and \(B\) are sets, then \(A \cup B = A \cap B\).

Answer:

6. Prove using mathematical induction that

\[
1.2 + 2.3 + 3.4 + \cdots + n(n+1) = \frac{n(n+1)(n+2)}{3}
\]

when \(n\) is positive integer.

Answer: