

Chapter 1:

1. Determine which of the following sentences are statements. What are the truth values of those that are statements.
 - (a) $\sqrt{2}$ is not a rational number.
 - (b) Is $\sqrt{2}$ a rational number ?
 - (c) Show that $\sqrt{2}$ is not a rational number.
 - (d) If $1 = 0$, then $5 = 4$.
2. Write the truth tables for each expressions.
 - (a) NOT (P OR Q)
 - (b) (P AND Q) implies R
 - (c) (NOT P) implies (Q is equiv to R).
3. Is (P implies Q) equivalent to (NOT P implies NOT Q)? Give reasons.
4. Let A, B be two sets. Show that $A \cap B = A \cup B$ if and only if $A = B$ (by direct proof method).
5. Show that if $x^2 + 2x^3 = 5$, then $x < 2$ (by contrapositive method).
6. Show that the equation $x^2 + x + 1 = 0$ has no real solutions (by contradiction).
7. Show that the statement "if $x^2 > 4$, then $x > 2$ " is false (by counterexample).