1. Work out the truth tables for the following logical expressions:
   (i) \(a \lor b\)
   (ii) \(a \land b\)
   (iii) \(a \rightarrow b\)
   (iv) \(a \leftrightarrow b\)
   (v) \((\sim p) \lor [q \land r]\)

2. Find a logical expression \(w\) for which the truth table is given by

\[
\begin{array}{ccc}
P & Q & W \\
T & T & T \\
T & F & F \\
F & T & F \\
F & F & T \\
\end{array}
\]

\(w = \)

3. Express the following logical expressions as Boolean algebra expressions:
   (i) \(\sim q \lor (x \land \sim y)\)
   (ii) \(x \rightarrow y\)
   (iii) \(x \leftrightarrow y\)
   (iv) \((p \land q) \rightarrow p\)
   (v) \(p \rightarrow (p \lor q)\)
   (vi) \((p \lor q) \rightarrow p\)
   (vii) \(p \rightarrow (p \land q)\)

4. Use Boolean algebra to prove that
   (i) \(p' + (p + q) = 1\)
   (ii) \([(p' + q)(q' + r)]' + (p' + r) = 1\)

5. A tautology is a proposition which is always true. State which of the following are tautologies:
   (i) \(p \leftrightarrow p\)
   (ii) \(p \rightarrow (p \land q)\)
   (iii) \([(p \rightarrow q) \land (q \rightarrow r)] \rightarrow (p \rightarrow r)\)