1. Let \( p \) and \( q \) be the propositions:

- \( p \): I bought a lottery ticket this week.
- \( q \): I won a million dollars

Express the following propositions as English sentences

(a) \( \neg p \)
(b) \( p \lor q \)
(c) \( p \rightarrow q \)
(d) \( p \land q \)
(e) \( p \iff q \)
(f) \( \neg p \rightarrow \neg q \)
(g) \( \neg p \land \neg q \)
(h) \( \neg p \lor (p \land q) \)

2. When planning a gathering to watch the Cardinals, you want to know whom to invite. Among the people you would like to invite are three touchy friends. You know that if Jasmine attends, she will become unhappy if Samir is there. Samir will attend only if Kanti will be there. Kanti will not attend unless Jasmine also does. Which combinations of these three friends can you invite so as to not make someone unhappy.

3. Show that \( (p \rightarrow q) \lor (p \rightarrow r) \) and \( p \rightarrow (q \lor r) \) are logically equivalent.

4. Show that \( (p \lor q) \land (\neg p \lor r) \rightarrow (q \lor r) \) is a tautology.