- (1) Use De Morgan's laws to express the negation of "Miguel has a cellphone and he has a laptop computer".
- (2) Use De Morgan's laws to express the negation of "Heather will go to the concert or Steve will go to the concert".
- (3) Show that $\neg(p \lor (\neg p \land q))$ and $\neg p \land \neg q$ are logically equivalent by developing a series of logical equivalences.

- (4) Show that $(p \wedge q) \rightarrow (p \vee q)$ is a tautology.
- (5) Show that $\neg(p \rightarrow q)$ and $p \land \neg q$ are logically equivalent.

(6) Show that $(p \to q) \to r$ and $p \to (q \to r)$ are not logically equivalent.

(7) Consider the following conditional statement.

 $[(p \lor q) \land (p \to r) \land (q \to r)] \to r$

(i) Show that it is a tautology by using truth tables.

(ii) Show that it is a tautology without using truth tables.