CS311, Spring 2004
Homework 3. Due Tuesday February 3

**Question 1** Give the converse and contrapositive for each of the following statements:
(a) If it were a snake then it would have bitten you.
(b) I will do well only if I study.
(c) If I am tall or fast then I can be great at basketball.

**Question 2** For each of the following say whether or not it is a tautology.
Use a truth table to justify your answer.
(a) \((p \land q) \lor (\neg p \land \neg q)\)
(b) \((p \land q) \rightarrow (p \lor q)\)

**Question 3** Show that this is a tautology by simplifying using the laws of logic:
\(\neg(\neg p \land q) \lor (p \lor \neg q)\)

**Question 4** Write each of the following arguments in logical notation and prove or disprove.
(a) If Duke is growling, then he is angry.
   Duke is not angry.
   Therefore Duke is not growling.
(b) If it is snowing, then the temperature is low.
   If the temperature is low, then the pipes might freeze.
   If it is snowing then the pipes might freeze.
   Therefore either the power is out or my computer has a bug.
(c) If it is Saturday or it is Sunday then campus is not crowded.
   It is not Saturdy and not Sunday.
   Therefore campus is crowded.
(d) If it is Saturday or it is Sunday then campus is not crowded.
   Campus is crowded.
   Therefore it is not Saturday and not Sunday.