Math 300A&B **Introduction to Mathematical Reasoning** **Fall 2009**

Assignment #2: Due Wednesday, 10/14/09

Part I:

1. Eccles, pp. 19–20, Exercises 2.1, 2.4, 2.5(ii).

2. Eccles, p. 53, Problems 2 and 3.

3. A statement form is called a ***tautology*** if it is true regardless of the truth values of its individual statement variables, and a ***contradiction*** if it is false regardless of their truth values. For example, the following truth table proves that the statement form $P \vee \sim P$ is a tautology:

P	$\sim P$	$P \vee \sim P$
T	F	T
F	T	T

Write out the truth table for each of the following statement forms, and determine if it is a tautology, a contradiction, or neither.

   (a) $P \Rightarrow \sim(Q \wedge (\sim P))$.

   (b) $P \Rightarrow ((\sim R) \vee Q) \wedge R$.

   (c) $(\sim P \Rightarrow (Q \wedge (\sim Q))) \Rightarrow P$.

4. Consider the following implications:

   (a) n is prime only if it is odd.

   (b) If n is prime, then it is odd.

   (c) For n to be composite, a necessary condition is that it not be even.

   (d) If n is even, then either it is composite or it is equal to 2.

   (e) If n is equal to 4, then it is neither prime nor odd.

   (f) n is odd if it is prime and not equal to 2.

For each implication, do the following:

   (i) Determine the hypothesis and the conclusion.

   (ii) Translate it into a symbolic statement.

   (iii) Write its negation in symbolic form, and simplify it.

   (iv) Translate the negation back into an English statement.

Use the abbreviations $P(n)$, $C(n)$, $E(n)$, and $O(n)$ with the same meanings as in Problem 4 of Assignment 1.