CSE 20, Discrete Mathematics, Spring 1997
Homework 1, Due, Monday April 14, 2 PM
Extra Credit 1 , Rough drafts due Thursday April 17, 2:30
60 points total

Short problems (2 pts each.):

- Epp, Section 1.1, (pp. 15-16) 7,9, 10b,10d,13,24
- Section 1.2 (p. 28), 27, 39
- Section 1.3 (pp. 40-41) 25, 28, 31
- Section 1.4 (pp. 55-56) 2, 4, 25,

Full Proofs: The following are worth 8pts each. For examples of similar, solved problems, see the solved problems in sections 1.3 and 1.4 of Epp, particularly 35-38 of Section 1.3. For the next two problems, convert all of the statements into symbolic form, and give a proof that the given statements imply the conclusion.

1. Given:
   (a) If I do not have my umbrella, then either I left it in class or at home. (Note: I mean "or" in the non-exclusive sense.)
   (b) If it rained on my way to class, and I left my umbrella at home, then I would be wet.
   (c) It rained on my way to class.
   (d) I am not wet, and I do not have my umbrella.

   Conclusion: I left my umbrella in class.

2. Given:
   (a) If Norma wants to go to her morning meeting, she must wake up early.
   (b) If she goes out, she will get home late.
   (c) If she gets home late, and wakes up early, she will be working on little sleep.
   (d) Norma will not work on little sleep.

   Conclusion: Norma will either not go out, or will miss her morning meeting. (I am using "or" in the non-exclusive sense.)

3. Consider the Boolean function with three inputs x, y, z defined by $f(x, y, z) = x \vee [(x \wedge y) \vee ([\neg y] \vee z)]$. First give a diagram of the obvious Boolean circuit for f. Then design a circuit for f using as few gates as you can and prove that your circuit computes f. Hint: Consider the cases $x = T$ and $x = F$, both in the design and in the proof.).

4. Epp, Section 1.4 (p. 56) , problem 27.

Extra Credit: General rules: Extra credit points are added to your final grade. No one person may recieve more than 10 extra credit points in the course. Assignments can be done in groups up to three, but points will be divided evenly among the members of a group. Points will only be awarded for near perfect answers; partial credit will only be awarded very infrequently. However, any rough draft submitted before the given date will be given back with extensive comments, and will not count against the final draft. The final draft may be submitted at any time before June 1.

Problem 1: I went to a party with my wife and three other couples. At the party, some people shook hands and some didn't. Of course, no one shook hands with themselves or their own spouse. At the end, I asked each person at the party how many hands they shook, and each person gave me a different answer. How many hands did I shake? Prove your answer with an informal, but complete, case analysis. (3 points.)