CSE 311: Foundations of Computing I

Homework 1 (due Wednesday, June 28th at 11:59 PM)

Directions: *Write up carefully argued solutions to the following problems. Each solution should be clear enough that it can explain why it works to someone who does not already understand the answer. If you work with others, remember to follow the collaboration policy outlined in the syllabus. Be sure to read the Typesetting and Grading guidelines prior to submitting.*

1. Syllabus (2 points)

Read the syllabus. On your homework submission write "I have read the syllabus, and agree to follow the collaboration policies" for full credit.

2. Translation (16 points)

Translate the English statements into propositional logic. You will need to define the propositions you use. Make sure the propositions you introduce are atomic, meaning they are as simple as possible.

(a) [4 Points] Parking is allowed on Saturday and Sunday.

(b) [4 Points] You can become the Queen of England only if you are born a royal or participate in a popular uprising.

(c) [8 Points] Define a set of *at most three* atomic propositions. Then, use them to translate all of these sentences into logical notation. *Do not simplify the statements.*

i. I go to the library because I want to study.

ii. To go to the library, I need to bring my Husky Card.

iii. If I don't want to study, then I will not go to the library, but will still bring my Husky Card.

3. Trickier Translation (6 points)

Convert the following statement into propositional logic. Then write an English sentence that has the same meaning, but is clearer logically.

Unless you carry cash with you, if you don't have your Husky Card, you can't ride the bus or the light-rail.

4. Equivalent or Not (12 points)

For each of the following pairs of propositions, use truth tables to determine whether they are equivalent or not.

Include the full truth table and state whether they are equivalent. (In principle, only one row is needed to show non-equivalence, but please turn in the entire table so that we can give partial credit in case of errors.) Your truth table should include columns for all subexpressions.

(a) [4 Points] $(P \wedge Q) \wedge (P \vee Q)$ vs. $P \vee Q$

(b) [4 Points] $P \oplus Q$ vs. $\neg P \oplus \neg Q$

(c) [4 Points] $P \rightarrow (Q \rightarrow R)$ vs. $(P \wedge Q) \rightarrow R$

5. Highly Illogical (12 points)

You have two tickets to the Taylor Swift Eras tour. Your friend, a 311 legend, is ruthlessly and perfectly logical. She takes each statement at its exact logical meaning.

You want your friend to help you move out of your apartment, and have resorted to bribery. You're willing to give her a ticket to the tour in exchange for help moving. Your friend loves Taylor Swift but hates moving. She would rather have the tickets and help you move then do neither. However, she won't help you move unless she knows that she's guaranteed to get your tickets, and that it's the only way to get your tickets.

(a) [4 Points] You tell your friend "If you help me move, I will give you a ticket to the tour." Your friend says, "It is not yet logical to help you move." Why is your friend unwilling to help? (1-2 sentences).

(b) [4 Points] You try again: "Forget the first promise. If you don't help me move, I won't give you a ticket to the tour." Your friend says, "It is still not logical to help you move." Why is your friend still unwilling to help? (1-2 sentences).

(c) [4 Points] Give a logical sentence that would compel your friend to help you move. Argue why she will finally help you.

6. Optional: Logic Puzzle (0 points)

Suppose there's a barber who shaves those people, and only those people, who do not shave themselves. Can there exist such a barber?

7. Feedback (2 points)

Please share approximately how many hours you spent working on this assignment. Report your estimate to the nearest hour. This will help us calibrate our assignments in the future.

If you have any additional feedback, we welcome that as well.