

CS 313k - Homework #1
100 points possible

Give clear, legible answers to all questions.

1. Translate the following into logical notation. Use only the 5 basic connectives and \oplus . Define your own propositional variables. Some of these exercises require you to determine whether inclusive or exclusive or is intended in the English statements.
 - (a) Soup or dessert comes with dinner.
 - (b) You can pay the bill with dollars or euros.
 - (c) This job requires experience with Java or C++.
 - (d) You publish or perish in this department.
 - (e) Tom gets caught whenever he cheats.
 - (f) I will send you the information only if you send me an email request.
 - (g) I attend class whenever there is going to be a quiz.
 - (h) You must have a password to log onto the server.
2. Let P, Q and R be the following propositions.
P: You drive over 70 mph.
Q: You miss the first cs 313k quiz.
R: You get a ticket.
Translate these sentences into logic. The only connectives you should use are $\wedge, \vee, \neg, \rightarrow, \leftrightarrow$.
 - (a) You drive over 70 mph, but you do not get a ticket.
 - (b) You will get a ticket if you drive over 70 mph.
 - (c) Driving over 70 mph is sufficient for getting a ticket.
 - (d) Whenever you get a ticket, you are driving over 70 mph.
3. Are these equivalences and implications true or false?
 - (a) $1+1 = 3$ if and only if pigs have wings.
 - (b) If 2 is even, then apples grow on trees.
 - (c) $0 > 1$ if $2 > 1$.
 - (d) If pigs can fly, then 3 is an even number.
4. State the converse, contrapositive and inverse of each statement.

- (a) If it rains tomorrow, I will stay home.
 - (b) I go to the park whenever it is sunny.
 - (c) When I stay up late, it is necessary that I sleep late.
5. Give a truth table for each proposition, and indicate if it is a contingency, contradiction or tautology.
- (a) $(P \vee \neg Q) \rightarrow Q$
 - (b) $P \oplus (P \vee Q)$
 - (c) $(P \leftrightarrow Q) \oplus (\neg P \leftrightarrow Q)$
 - (d) $\neg P \leftrightarrow Q$
 - (e) $((P \rightarrow Q) \rightarrow R) \rightarrow S$
6. Five friends have access to a chat room. Is it possible to know who is in the chat room if we know the following? If so, who is in the chat room? Explain your reasoning. You do not need to provide a formal proof - give your answer and a clear explanation (in English) of why your answer is correct.
- Either Cindy or Robin, or both, are chatting.
 Either Harris or Lillian, but not both, are chatting.
 If Adrian is chatting, so is Harris.
 Lillian and Cindy are either both chatting or neither is.
 If Robin is chatting, then so are Adrian and Cindy.
7. Use truth tables to prove:
- (a) the contrapositive law
 - (b) the exportation law
8. Determine if the following argument is valid. If the argument is correct, what rule(s) of inference are used? If it's not correct, what is the logic error in the argument?
- It is not raining or I have an umbrella.
 I do not have an umbrella or I do not get wet.
 It is raining or I do not get wet.
 Therefore I do not get wet.