

## Math 135: Discrete Mathematics, Fall 2010

### Worksheet 1

1. While working on your homework in the library late one night, you come across Kevin and Dan, who offer to help you with your homework. However, you are not sure if they will tell you the truth or mislead you. Kevin tells you, "Dan is lying". Dan says, "We are both telling the truth". Who, if anyone, is telling the truth? Provide an argument or truth table to show your reasoning.
2. Use truth tables to check if each of the given pairs of symbolic logic statements are equivalent.
  - (a)  $p \rightarrow q$  and  $q \rightarrow p$  (Note: This is a generic implication and its converse)
  - (b)  $\neg p \rightarrow \neg q$  and  $q \rightarrow p$  (Note: This is the inverse and converse of a generic implication  $p \rightarrow q$ .)
  - (c)  $p \wedge (p \rightarrow q)$  and  $p \vee q$

3. Use the letter  $t$  to represent the statement Bill is tall,  $d$  for Bill is dark, and  $h$  for Bill is handsome. Use these names along with the basic logic operations to write each of the following English sentences in symbolic logic notation:

- (a) Bill is tall, dark, and handsome.
- (b) Bill is tall and dark, but not handsome.
- (c) Either Bill is tall or he is handsome, but not both.
- (d) Bill is neither tall nor handsome.

4. Use the phrases in the previous exercise to write an English statement equivalent to each of the following propositions:

- (a)  $(t \vee d \vee h) \wedge \neg(t \wedge d \wedge h)$
- (b)  $\neg t \wedge \neg d$
- (c)  $d \wedge \neg(t \wedge \neg d)$
- (d)  $(t \wedge d) \vee (\neg t \wedge d)$