Problem 1. *Suppose we have the following statement:*

> *Bob is blonde or makes more than $150,000 a year, and has a nice car.*

(a) Suppose Bob is not blonde. Is the statement true or false?

(b) Break the statement down into three separate Boolean statements combined using "and"s and "or"s.

(c) Negate the statement, making sure to simplify fully.

Problem 2. *Negate each expression, simplifying the negation fully:*

(a) A and B

(b) (A and B) and C

(c) A or (B and (C or D))

(d) (B or C) xor D

Problem 3. *Write A = "if it is raining, then the street is wet".*

(a) What are the parts of this statement? Call them B and C.

(b) Write A as a Boolean expression using B and C.

(c) Negate your answer from part b and simplify.

(d) Write out "not A" in words, based on your answer in part c.

Problem 4. *Write out the truth tables for "A implies B" and "(not A) or B". What do you notice?*

Problem 5. *Let A be the statement "I will pass the test only if I get up on time and drink coffee".*

(a) What are the parts of this statement? Call them B, C, and D.

(b) Write A as a Boolean expression using B, C, and D.

(c) Negate your answer from part b and simplify.

(d) Write out "not A" in words, based on your answer in part c.

(e) Suppose A is true, but you don't drink coffee. What can you conclude?

Problem 6. *Let A be the statement "A shape is a square if and only if it has four sides and all of its sides have equal length".*

(a) Write A out as a combination of simpler statements (as in the previous problems).

(b) Negate A, simplifying the negations completely.

(c) What kind of shape would you have to find to prove that A is false?