

## INTRODUCTION TO LOGIC – HOMEWORK #1 – Due Feb 4

### 1 PASTA [30 POINTS]

Making a pasta dish is relatively easy. You buy a box of pasta; you heat the water; when the water boils, you add the pasta and wait until cooked. While you wait for the water to boil and the pasta to cook, you prepare a sauce. When the pasta and the sauce are ready, you mix them together.

In class, we've seen that seemingly simple tasks, such as cracking an egg, are in fact rather complex. Suppose you want to tell a computer—which has no common-sense and knows nothing about the world—how to make a pasta dish. Write the most excruciatingly detailed series of instructions which leave (almost) nothing unsaid. *Once you fill up half a page, single-spaced, you may stop.* The goal is to write instructions which are so detailed that half a page won't be enough to describe how to pick up the box of pasta.

### 2 DOES AMBIKA LIKE CLEVON? [40 POINTS]

Clevon tells Ambika the following:

If you don't like someone, then you will not invite this person to your party. You did not invite me to your party last night. Therefore, you do not like me.

Is Clevon's reasoning good? Answer as follows:

- (a) Divide the reasoning into premise (1), premise (2) and a conclusion.
- (b) Check whether the reasoning conforms to a good reasoning pattern such as Modus Ponens or Modus Tollens (Syntactic Method).
- (c) Write down all the possibilities, rule out the possibilities excluded by the premises and check whether the conclusion is true in all the remaining possibilities. Does this show that Clevon's reasoning is good or not? (Semantic Method) [*hint*: there are a total of four possibilities, one of them being that Ambika does not like Clevon and she did not invite him to the party.]

### 3 COLORS, 1'S AND 0'S [30 POINTS]

Draw a table with 4 rows and 9 columns. Please color each cell in the table and assign a 0 or a 1 to each cell. Make sure you satisfy the three constraints below:

- (C1) For any cell  $c$  in a given column, there is exactly one other cell  $c'$  in another column such that  $c$  and  $c'$  are filled with the same color. (NB: the expression 'exactly one' means 'at least one and at most one.')
- (C2) Each column has exactly one cell to which the number 1 is assigned.
- (C3) Twin cells must be assigned either both 1's or both 0's.

If you think that the above coloring and numbering task cannot be done, explain—as precisely as you can—why it cannot be done. Can at least (C1) and (C2) be satisfied? Explain your answer.