

COMPUTER SCIENCE 20, SPRING 2012
DISCRETE MATHEMATICS FOR COMPUTER SCIENCE

Class #7 (Logic and Computers)

Homework, due in hard copy Wednesday 2/8/2012 at 10:10am

Please write your TF's name on your homework, and list the names of any students with whom you collaborated.

1. (a) Design a half-subtractor circuit: for inputs a, b (each a single bit), give formulas for the difference $a - b$ and the "borrow bit" c indicating whether a bit must be borrowed from the next digit.
- (b) Design a full-subtractor circuit: for inputs a, b, c_{in} , give formulas for the difference $a - b - c_{in}$ and the borrow bit c_{out} indicating whether a bit must be borrowed from the next digit.
2. (a) Simplify the following formula as much as possible:

$$(p \vee (p \wedge q)) \wedge \neg(\neg p \vee q) \wedge (\neg q \vee r)$$

- (b) How many logic gates does the original expression in part (a) require?
How many does your new expression require?