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Handout #8
CS109

due: 1/26, 108 points

Problem Set #2

This is a problem set that you are likely to find more challenging than most of the others in CS109. It takes practice to develop the skill of doing proofs. This problem set is meant to provide that practice, so there are a lot of proofs to do. Because of the nature of the problems and the necessity for “insight” in order to solve some of the problems, it is important that you start this problem set early and work on it over the next week. If you are really rusty doing proofs, use the problems in the textbook as "warm-ups". There are a wide variety of proofs to try in sections 3.1 and 3.2.

The key in writing up proofs (assuming you know why the result being proven is true) is to know what to include and what to leave out. Usually, that depends on your audience. If you are a beginner, you are writing the proof for an audience of one – your TA. S/he wants to be convinced that *you* understand why the assertions in the proof are true. So error on the side of inclusion: be sure to include all the steps (assume nothing!), and give valid reasons for each step. In proofs for this class, always give more information than less.

To receive full credit for proofs, include all three steps (statement of what is to be proven, statement and reason chart (or a paragraph for counterexamples or construction proofs), and a concluding statement). If you have trouble completing a proof, give us everything you have because partial credit will be awarded.

Methods of Proof

Rosen, Section 3.1:

#16a,c (3 points each)
#24 (7 points)
#30 (9 points)
#54 (10 points)

Induction

To receive full credit for inductive proofs, follow the format given in the Induction handout (the "*six* steps"). Be sure to include all six steps. All the following should be proven using some form of induction. If you have trouble completing a proof, give us everything you have because partial credit will be awarded.

Rosen, Section 3.2:

#6 (6 points)
#8 (6 points)

#12 (8 points)
#22 (8 points)
#32 (8 points)
#44 (8 points)
#48 (8 points)
#54 (8 points)
#56 (8 points)

Parity is a property of binary strings defined as follows :
If you add up the digits of the binary string and the result is divisible by 2, the string has even parity, otherwise it has odd parity.

We define B-strings as follows:
(1) 0111 is a B-string
(2) 100 is a B-string
(3) if B_1 and B_2 are B-strings, $1B_1010B_21$ is a B-string
(4) if B_1 and B_2 are B-strings, B_11B_2 is a B-string
Prove that all B-strings have odd parity.
(8 points)