Due September 19 Homework 2

Math 167 / CS 142: Complexity Theory

- 1. Suppose that a Boolean circuit with n inputs has a AND- and OR-gates and b NOT-gates. Show that the same Boolean function can be computed by a circuit with 2a AND- and OR-gates and n NOT-gates.
- 2. Construct a Boolean circuit that has three inputs x, y, and z, and three outputs NOT(x), NOT(y), and NOT(z). You may use any number of AND- and OR-gates but only *two* NOT-gates.
- 3. Problem 4.4.13 of the text.

A monotone Boolean function F is one that has the following property: If one of the inputs changes from false to \mathbf{true} , the value of the function cannot change from \mathbf{true} to false. Show that F is monotone if and only if it can be expressed as a circuit with only AND and OR gates.

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