Illinois Institute of Technology
Department of Computer Science

CS 330 Discrete Structures

Fall Semester, 2010

Homework Assignment 3

Due date: 20th September, 2010

1. (#24 in page 85) Show that at least 3 of any 25 days chosen must fall in the same month of the year.
2. (# 32 in page 86) Show that these statements about the real number x are equivalent: (i) x is rational, (ii) $x/2$ is rational, and (iii) $3x - 1$ is rational.
3. (# 28 in page 103) Prove that there are no solutions in integers x and y to the equation $2x^2 + 5y^2 = 14$.
4. (# 34 in page 103) Prove that between every rational number and evry irrational number there is an irrational number.
5. (# 44 in page 131) Show that if A, B, and C are sets, then
$$|A \cup B \cup C| = |A| + |B| + |C| - |A \cap B| - |A \cap C| - |B \cap C| + |A \cap B \cap C|.$$
6. (# 24 in page 147) Show that the function $f(x) = e^x$ from the set of real numbers to the set of real numbers is not invertible, but if the codomain is restricted to the set of positive real numbers, the resulting function is invertible.

   The following questions are for the recitation class. You do NOT need to answer it in your homework.

7. (#22 in page 85) Show that if you pick three socks from a drawer containing just blue sucks and black socks, you must get either a pair of blue socks or a pair of black socks.
8. (#33 in page 86) Show that these statements about the real number x are equivalent: (i) x is irrational, (ii) $3x + 2$ is irrational, and (iii) $x/2$ is irrational.
9. (# 32 in page 103) Prove that $\sqrt[3]{2}$ is irrational.
10. (# 43 in page 131) If A, B, C and D are sets, does it follow that $(A \oplus B) \oplus (C \oplus D) = (A \oplus D) \oplus (B \oplus C)$?