CSC/MAT-220: Discrete Structures

Homework 2

Due: 9/8/2017

Book Problems

Please do each of the following problems from your book:
8.12, 9.7, 9.18, 10.13, and 12.21.

Other Problems

I. Below are two strategies for determining the truth value of a statement involving a positive number x and another statement $P(x)$.

   i. Find some $x > 0$ such that $P(x)$ is true.

   ii. Let $x > 0$ and show that $P(x)$ is true.

   For each statement below, indicate which strategy is more appropriate.

   a. $\forall x > 0,\ P(x)$.

   b. $\exists x > 0\ \ni\ P(x)$.

   c. $\exists x > 0\ \ni\ \neg P(x)$.

II. Prove the following statement:
Let A be a subset of U, then $A \cup (U - A) = U$.

III. Let f_n denote the number of ways to tile a board of n squares, using squares and dominoes (two squares joined together). Give a combinatorial proof for each of the following propositions.

   i. For $n \geq 0$, $f_0 + f_1 + f_2 + \cdots + f_n = f_{n+2} - 1$.

   ii. For $n \geq 0$, $f_0 + f_2 + f_4 + \cdots + f_{2n} = f_{2n+1}$.

   iii. For $n \geq 1$, $f_1 + f_3 + \cdots + f_{2n-1} = f_{2n} - 1$.