

# 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. Write the following definition and its negation using quantifiers and logical symbolism.
  - a. A function  $f: D \rightarrow \mathbb{R}$  is *continuous* at  $c \in D$  if and only if for every  $\epsilon > 0$  there exists a  $\delta > 0$  such that  $|f(x) - f(c)| < \epsilon$  whenever  $|x - c| < \delta$  and  $x \in D$ .
  - b. A function  $f$  is *uniformly continuous* on a set  $S$  if and only if for  $\epsilon > 0$  there is a  $\delta > 0$  such that  $|f(x) - f(y)| < \epsilon$  whenever  $x$  and  $y$  are in  $S$  and  $|x - y| < \delta$ .
- 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  $n \geq 1$ ,  $f_1 + f_3 + \cdots + f_{2n-1} = f_{2n} - 1$ .