ASSIGNMENT 2 — ECE 103 (Spring 2009)

Due in tutorial on Monday, May 25.

1. In this problem, suppose that n is an integer.
   (a) What is the contrapositive of the statement "If $n^2 + 4n + 3$ is odd, then n is even"?
   (b) Prove the statement "If $n^2 + 4n + 3$ is odd, then n is even".

2. Prove that for all $n \in \mathbb{N}$, $\displaystyle\sum_{j=1}^{n} j^3 = \frac{1}{4}n^2(n+1)^2$.

3. Consider an $x \times y$ rectangular grid of unit squares, where x and y are positive integers. Suppose we can break the grid into two smaller grids along any horizontal or vertical grid line. (In other words, we can break the $x \times y$ grid into an $x' \times y$ grid and an $(x-x') \times y$ grid, where $1 \le x' \le x-1$; or an $x \times y'$ grid and an $x \times (y-y')$ grid, where $1 \le y' \le y-1$.) Prove that $xy - 1$ breaks are needed to break the original $x \times y$ grid into individual unit squares.

4. For each pair a and b, compute the quotient and remainder when a is divided by b.
   (a) $a = 273$, $b = 11$
   (b) $a = -273$, $b = 11$
   (c) $a = 273$, $b = -11$
   (d) $a = -273$, $b = -11$