HOMEWORK 12
DISCRETE MATHEMATICS I
DUE 03-07

The definition of divisibility by 3 is that n is divisible by 3 if and only if it can be written in the form $n = 3q$ for some integer q. You may assume the following fact about integers:

Every integer n is of the form $n = 3q$ for some integer q, or $n = 3q + 1$ for some integer q, or of the form $n = 3q + 2$ for some integer q.

(1) Prove that, if n is an integer that is even or odd, then $n + 1$ is even or odd. (You may **not** assume that every integer is even or odd.)

(2) Prove that an integer n is divisible by 3 if and only if n^2 is divisible by 3.

(3) Prove that $\sqrt{3}$ is irrational.

- **Four** book problems: #1.5.25, 26, 29, 33.