**Nipissing University Senior Mathematics Competition**

Problem Set 2 – Proof By Contradiction – May 7, 2010

Prove all of the following using a contradiction. Be sure to clearly state what your assumption is, and why you have arrived at a contradiction.

1. There is no greatest integer.
2. For all integers $n$, if $n^{2}$ is odd then $n$ is odd.
3. There are no real solutions to the equation $3x^{2}+3x+1=0$ .
4. A triangle cannot have two right angles.
5. If $a$ is a rational number and $b$ is an irrational number, then $a+b$ is an irrational number.
6. The fourth root of 2 is irrational.
7. If $a, b, $and $c $are the (nonzero) side lengths of a triangle and $a, b, $and $c$ satisfy the relation $a^{2}+b^{2}=c^{2}$, then the triangle is a right triangle. (Assume the Pythagorean Theorem has already been proved.)