CS 173 Discussion Session Sections ADA and ADB: Week 1

Name:____________________ Section:____________________

Directions: Solve as many problems as you can with your group. Start with the problem assigned to your table. Your table may be asked to present the solution to your assigned problem.

$\boxed{\mathbf{1}}$ Show following statements are true with a proof by contradiction:

a) If we have a list of n integers whose sum is not divisible by 3, then at least one of the n integers is not divisible by 3.

b) Let a, b, and c be positive real numbers. If $ab = c$ then $a \leq \sqrt{c}$ or $b \leq \sqrt{c}$.

c) There is no rational number r for which $r^3 + r + 1 = 0$.

$\boxed{\mathbf{2}}$ Show following statements are true with a proof by contradiction:

a) The sum of a rational number and an irrational number is irrational.

b) If $n^3 + 5$ is odd, then n is even.

c) There are an infinite number of prime numbers.

Challenge Problems:

a) Use proof by contradiction to show that, in a non-degenerate right triangle (i.e. all side lengths are greater than 0), the length of the hypotenuse is less than the sum of the lengths of the two remaining sides.

b) Prove that the set $\{x \in \mathbb{R} \mid 0 < x < 1\}$ is uncountable. (If a set is *countable* then you can make a (possibly infinite) numbered list of all the elements. You want to show that you cannot make such a list containing *all* of the real numbers between 0 and 1.)