COT 3100 Fall 2017 Homework #2
Please Consult WebCourses for the due date/time

1) Let n be an odd integer. Prove that $n^2 - 1$ is divisible by 8. After you prove this formally, attempt to give an intuitive reason why this turns out to be true similar to the intuitive reason that integers of the form k(k+1), when k is an integer, are even.

2) Prove the following statement using (a) direct proof and (b) proof by contradiction.

If n is an even integer, then 3n+2 is even.

3) Use direct proof to show that every odd integer can be expressed as the difference of two perfect squares. (Note: A perfect square is simply any integer of the form n^2, where n is an integer.)

4) Given a set of real numbers $a_1, a_2, \ldots, a_n$, let their average be b. Prove that there exists at least one number in the set that is greater than or equal to b. (Hint: use proof by contradiction!)

5) Let S = {2, 3, 5} and T = {1, 2, 4, 6}. Explicitly list the members of the following sets: $S \cup T$, $S \cap T$. $S - T$, $S \times T$, $T \times S$, $\wp(S)$ and $\wp(T)$.

6) Let *A*, *B*, and *C* be sets. Show that

$$(A - B) - C = (A - C) - (B - C).$$

Hint: Start with the right side of the equation and use the Set Laws and Definitions to prove that this set is equivalent to the left side of the equation.

7) Give a summary of the life and mathematical contributions of Srinivasa Ramanujan. Please aim for a length of roughly 200 - 400 words. ***Your summary must be typed.*** Please state the sources you used in writing your summary and please don't just copy the blurb from the textbook… (If you loved writing this summary, you should watch the movie, The Man Who Knew Infinity.)