COT 3100 Fall 2018 Homework #3
Please Consult WebCourses for the due date/time

1) In general, you were told in class that for all integers a and b and positive integers n, if $a \equiv b \ (mod\ n)$, then $f(a) \equiv f(b) \ (mod\ n)$, where f is any function that operates on integers only. Using the definition of mod only, prove this specifically for the function $f(a) = a^3$.

2) Convert the following values from the bases indicated to base 10:

i) 2165_7
ii) $BCF2_{16}$
iii) 12345_8
iv) 21302_4
v) 101001111101_2

3) Convert the following base 10 values to the bases indicated:

i) 22111 to base 12
ii) 83810 to base 16
iii) 907 to base 2
iv) 3209 to base 7
v) 4095 to base 8

4) Prove or disprove: if n(3n+1) is an even integer, then n is an integer.

5) A common divisibility rule is that a positive integer $n = d_k d_{k-1} \ldots d_0$, (where each d_i represents a single digit of n), is divisible by 9 if and only if $d_k + d_{k-1} + \ldots + d_0$ is divisible by 9. Rigorously prove this divisibility rule via mod rules.

6) Let x and y be integers such that $13 \mid (2x + 3y)$. Prove that $13 \mid (31x + 27y)$.

7) Give a summary of the life and mathematical contributions of Pierre de Fermat. 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.