COT 3100 Homework #3: Functions, Sequences, Sums, Matrices
Due Date/Time: Friday, January 31st, 2014 in recitation

1) An example of a functtion that maps UCF students to the set of positive integers is f(x) = the number of UCF courses student x has taken. Come up with a separate idea of a function from everyday life and list a table with five inputs to the function and their five corresponding outputs.

2) Prove that the function f(n) = 2n with the domain $n \in Z$ is a one-to-one (injective) function, but not an onto (surjective) function.

3) Let f(x) = x² - 6x + 4 for all real x ≥ 3. Determine f⁻¹(x). What is the range of f(x) and the domain of f⁻¹(x)? Also, show that if we allowed the domain to be all real values of x, the function f would not be invertible.

4) Let f(x) = (2x + 3)² and let g(x) = eˣ. Determine the functions f(g(x)) and g(f(x)).

5) What is the sum of the arithmetic sequence with first term 7, common difference 4 and 40 terms?

6) What is the sum of the geometric sequence with the first term 3, common ratio of 2 with 20 terms?

7) What is the sum of the infinite geometic sequence with first term 6 and common ratio $\frac{1}{3}$?

8) Determine the following sum in terms of n: $\sum_{i=1}^{2n-1}(3i^2 + 2)$.

9) Determine the following matrix product: $\begin{bmatrix} 2 & 6 \\ -3 & 4 \\ 5 & -1 \end{bmatrix}\begin{bmatrix} -6 & 5 & -1 \\ -2 & 4 & 7 \end{bmatrix}$.

10) Rewrite the following system of equations as a matrix equation:

$$3x + 4y - z = 15$$
$$2x - 5y + 4z = 41$$
$$x + 2y - 6z = -24$$