1) (12 pts) Using induction on n, prove that $3^{2n} + 5^{2n} \equiv 2 \pmod{16}$, for all non-negative integers n.

2) (12 pts) Consider the sequence a_1, a_2, …, defined as follows:

$$a_1 = 3, a_2 = 27, a_n = 6a_{n-1} - 9a_{n-2}$$

Using strong induction on n with two base cases, prove for all positive integers n that

$$a_n = (2n - 1)3^n$$

Last Name: _____ , **First Name :** _____

Lab Section: 11   12   13   18   19   21   22

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

4) (4 pts) Calculate the meet of the two following zero-one matrices:

$$A = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}, B = \begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}$$

5) (8 pts) The 16th term of an arithmetic sequence with a common difference of 4 is 100. Find the prime factorization of the sum of the first 41 terms of the sequence.

6) (4 pts) Find the sum of an infinite geometric sequence with the first term 6 with a common ratio of .7.