Math 1210 Tutorial #1 (Sep. 15th – Sep. 21st)

1. Use mathematical induction to prove that

$$\frac{1}{1 \cdot 5} + \frac{1}{5 \cdot 9} + \frac{1}{9 \cdot 13} + \cdots + \frac{1}{(4n-3)(4n+1)} = \frac{n}{4n+1}$$

for every positive integer n.

2. Use mathematical induction to prove that 8 divides $7 \cdot 5^{2n} + 1$ for $n \geq 1$.

3. Write the sum $2 + \dfrac{3}{2^1} + \dfrac{4}{2^2} + \dfrac{5}{2^3} + \cdots + \dfrac{22}{2^{20}}$ using sigma notation.

4. Use the identities

$$\sum_{j=1}^{n} j = \frac{n(n+1)}{2} \qquad \sum_{j=1}^{n} j^2 = \frac{n(n+1)(2n+1)}{6} \qquad \sum_{j=1}^{n} j^3 = \frac{n^2(n+1)^2}{4}$$

to evaluate

$$\sum_{k=6}^{19} (2k - 3k^2 + k^3).$$

5. Use mathematical induction to prove that $3^n > n^2$ for every positive integer n.