**MATH 1210 Tutorial # 2**

1. Prove that
$$\sum_{k=1}^{n}((2k-1)\sqrt{3})^2 = n(4n^2-1)$$
for every positive integer $n$.

2. Decide whether or not the equalities
$$\text{(a)}\ \sum_{k=1}^{n}(k+1)^3 = \Big(\sum_{k=1}^{n}(k+1)\Big)^2$$
and
$$\text{(b)}\ \sum_{k=0}^{n}(k+1)^3 = \Big(\sum_{k=0}^{n}(k+1)\Big)^2$$
hold for all positive integers $n$.

3. Rewrite the sum
$$\sum_{r=12}^{122}\frac{r-6}{r+9}$$
using an index whose initial and terminal values are 1 and 111, respectively (HINT: use a change of variables).

4. Simplify
$$\frac{169}{5+12i} + \Big(\overline{(1-2i)^3+4}\Big)^2$$
and express in Cartesian form.

5. Given that $i^2 = -1$, show that
$$\sum_{k=0}^{4n} i^k = 1$$
for all integers $n \geq 0$.