Math 301
Quiz 4
Spring 2005

Be neat and organized. Clearly indicate your answers. 20 points possible.

Do four of these five problems. If you try all five, clearly mark the one you don't want graded, or I might choose to grade the worst.

1. (5 pts.) Expand $(x - 2y)^7$.

2. (5 pts.) Transform the product by making the change of variable $i = k - 1$.

$$\prod_{k=5}^{n} \frac{k+9}{(k-3)!}$$

3. (5 pts.) Prove the following.

The square of any integer has the form $3k$ or $3k + 1$ for some integer k.

4. (5 pts.) Prove the following.

For all integers n, if $7 \nmid n^2$, then $7 \nmid n$.

5. (5 pts.) Use the Principle of Mathematical Induction to prove the following.

$$1 + 8 + 15 + \cdots + (7n - 6) = \frac{n(7n-5)}{2}, \qquad \text{for all integers } n \geq 1.$$