Mathematics 300

Quiz 26 **Name:**_____

You must show your work to get full credit.

Proposition. *If a, b, c, d, m are integers wtih $m \geq 1$ and*

$$a \equiv b \,(\mathrm{mod}\, m)$$
$$c \equiv c \,(\mathrm{mod}\, m)$$

then

$$ac \equiv bd \,(\mathrm{mod}\, m).$$

1. Use this proposition and mathematical induction to prove that for any integers a, b, and m with $m \geq 1$ that $a \equiv b \,(\mathrm{mod}\, m)$ implies $a^n \equiv b^n \,(\mathrm{mod}\, m)$ for all positive integers n.

2. Use mathematical induction to prove that for any postive integer n

$$1 + 4 + 7 + 10 + \cdots + (3n - 2) = \frac{n(3n - 1)}{2}.$$