Midterm 1 / March 10, 2005 / MAT 3233.001 / Modern Algebra

Name: _____

Please show all work.

1. Prove by induction $\displaystyle\sum_{k=1}^{n} k^2 = \frac{n(n+1)(2n+1)}{6}$.

2. Solve the linear congruence $13x \equiv 2 \bmod 31$.

3. Compute 3^{45} modulo 11 by repeated squaring and reduction. Show work.

4. For which natural numbers a and b does the equation $(a, x) = b$ have a solution? Prove your assertion.

5. In the commutative ring $\mathbf{Z}_4[i]$ which of $1 + i$ and $1 + 2i$ is a unit and which is a zero divisor? Explain. What is the order of the unit?

1	2	3	4	5	total (50)	%

Prelim. course grade: %