Math 453 **Homework 8** **Due Fri., Nov. 2, 2007**

You know the rules by now. The problems in this homework are from Chapter Five. **It is important to write your proofs carefully and clearly. It is important to cite results in the book if you write down an answer without doing much computation.**

(ungraded) Strayer – 10ac, 23ac, 30a

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1. Strayer – 10bd, 23bd.

2. Strayer – 30b, 31a.

3. Strayer – 18.

4. Compute $ord_{19}a$ for $a = 1, \ldots, 18$.

5. ($\mathcal{E}$) Compute $ord_{1085}2$. (Note: $1085 = 5 \cdot 7 \cdot 31$.)

6. ($\mathcal{E}$) You are told that 3 is a primitive root modulo 353. Given this information, solve the equation $x^8 \equiv 1 \mod 353$. Leave your answer in the form $x \equiv 3^{k_j} \mod 353$ for as many specific integers $k_1, \ldots$ as you need. (Note: This course used to be called Math 353, and 353 is prime.)

7. ($\mathcal{E}$) Find all four solutions to the equation $x^4 \equiv 1 \mod 41$. (Hint: $9^2 = 81 = 2 * 41 - 1$.) Using this result, find all four solutions to the equation $x^4 \equiv 16 \mod 41$.

8. (Extra credit) Find all odd primes p with the property that 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10 are all quadratic residues mod p. You may quote from class notes and previous homework solutions to simplify your work.