Math 453 **Homework 5** **Due Fri., Oct. 5, 2007**

The "ungraded" problems have their answers in the back. You are encouraged to work them and solutions will be provided, but they are, well, not graded. It is not necessary to submit these in your assignment. On the other hand, they are occasionally the basis for exam questions. You are always invited to work other problems as well. It may happen that part of a question is answered in the back of the book. You will not receive full credit unless you add some explanation. The symbol ($\mathcal{E}$) means that at least part of this problem appeared on an old exam, up to possible numerical alterations. The book numbers all problems in a chapter sequentially. **The problems in this homework are all from Chapter Three.** It is important to write your proofs carefully and clearly.

(ungraded) Strayer – Problems 5ce, 30ac, 42ac.

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1. Strayer – Problems 30bd, 42bd.

2. Strayer – Problem 43.

3. Strayer – Problem 47.

4. ($\mathcal{E}$) One more Chinese Remainder Theorem problem! Determine all **positive** integers n with the property that the last **three** decimal digits of $356n$ are "344". Hint: $1000 = 2^3 \cdot 5^3$.

5. ($\mathcal{E}$) One more Fermat/Euler Problem! Determine the last two decimal digits of 356^{344}.

6. ($\mathcal{E}$) The integer 15015 has the factorization $15015 = 3 \cdot 5 \cdot 7 \cdot 11 \cdot 13$. Compute $\phi(n)$, $v(n)$, $\sigma(n)$ and $\mu(n)$. You may leave your answers in the form of an unevaluated product.

7. ($\mathcal{E}$) Find ten different integers $n_k \geq 2$, $1 \leq k \leq 10$ with the property that $\gcd(a, n_k) = 1$ implies that
$$a^4 \equiv 1 \mod n_k.$$

8. Extra-credit (= no hints!) Strayer – Problem 40.