Math 453 **Homework 2** **Due Fri., Sept. 9, 2005**

There are three kinds of homework problems: ungraded, graded and bonus. Ungraded problems have answers in the back of the book – *Niven, Zuckerman, Montgomery*. Subject to unimportant numerical changes, one or two of them might well show up on a test. Graded problems don't have answers in the back of the book. Some of them will come with a symbol such as $(\mathcal{E})$, meaning that they are old exam questions. Bonus questions are intended for the graduate students taking this course for "extra" credit. All students benefit by trying all problems. You can use any mathematically valid technique to solve any problem.

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1. (ungraded) – §1.2 – 4.

2. (ungraded) – §1.3 – 22, (1) through (5).

3. (ungraded) – §2.1 – 1, 3.

4. (graded) – §1.2 – 13.

5. (graded) – §1.3 – 27. (There's a very short proof, with one special case.)

6. (graded) – §2.1 – 12.

7. (graded) – §2.1 – 13.

8. (graded) – $(\mathcal{E})$ Find all integers that simultaneously leave a remainder of 2 when divided by 4 and a remainder of 4 when divided by 6.

9. (graded) – $(\mathcal{E})$ True or false: if $gcd(a, b) = 1$ and $gcd(c, d) = 1$, then $gcd(a+c, b+d) = 1$. (I want either a proof, or a specific counterexample.)

10. (graded) – $(\mathcal{E})$ Find a pair of positive integers m and n with the property that $2 * gcd(m, n)$ is a square and $3 * lcm(m, n)$ is a cube. You are not asked to find **all** such pairs.

11. (bonus) – §1.3 – 39.

12. (bonus) – §1.3 – 50.

13. (bonus) – §2.1 – 54a.