MAT 312/AMS 351 – Fall 2010
Homework 5

1. Explain in your own words why, if n is a prime, a linear congruence equation $ax \equiv_n b$ always has a solution (i.e that given any integers a and b, there exists an integer x such that $ax - b$ is a multiple of n), and that any two solutions are the same modulo n.

2. Solve $3x \equiv_{19} 16$. *Not* by trial-and-error please.

3. Solve $5x \equiv_{14} 12$ (14 not prime, but (5,14) = 1 sufficient).

4. Review the procedure for the case $(a, n) = d \neq 1$.

5. Explain why $6x \equiv_{21} 2$ has no solutions.

6. Show that $6x \equiv_{21} 9$ if and only if $2x \equiv_7 3$.

7. Solve $2x \equiv_7 3$. Let x_0 be the unique solution.

8. Check that x_0, $x_1 = x_0 + 1 \cdot 7$ and $x_2 = x_0 + 2 \cdot 7$ are all *different* solutions of $6x \equiv_{21} 9$. Why does this not work for $x_0 + 3 \cdot 7$?

9. Find the seven solutions of $14x \equiv_{35} 21$.