

**MATH 312: ASSIGNMENT 4**  
**DUE DATE: OCTOBER 26, 2012**

- 1) Either find all solutions or show that there are no integral solutions for  $60x + 18y = 97$ .
- 2) Find the number of zeros at the end of  $1000!$ .
- 3) Construct a table for multiplication modulo 6. Write down the list of elements  $x$  in the complete set of residues which have the property that there exists also a  $y$  in the set such that  $x \cdot y = 1$  modulo 6.
- 4) Show that if  $x$  is prime, then the only solutions of the congruence  $x^2 \equiv x \pmod{p}$  are those integers  $x$  such that  $x \equiv 0$  or  $1 \pmod{p}$ .
- 5) Find all solutions of the linear congruence  $2x + 3y \equiv 1 \pmod{7}$ .
- 6) Find the least positive residue of  $2^{300}$  modulo 47.