

MATH 2500 Assignment #2

Due: February 14, 2014, Before Class (12:30)

Reminder: all assignments *must* be accompanied by a signed copy of the honesty declaration available on my website.

Assignments are to be handed in on $8\frac{1}{2} \times 11$ paper, single sided, no ragged edges, stapled in the top left hand corner with the honesty declaration as the first page.

1. For each of the following linear Diophantine equations, find all integer solutions for x and y :
 - (a) $1239x + 553y = 21$
 - (b) $572x + 1309y = 21$
 - (c) $978x + 1113y = 21$
2. For each of the following linear modular congruences, find all solutions:
 - (a) $877x \equiv 146 \pmod{2775}$
 - (b) $2980x \equiv 1262 \pmod{1288}$
 - (c) $759x \equiv 102 \pmod{1638}$
3. For each of the following systems of linear modular congruences, if possible, write as a single congruence:
(If it is not possible, explain why it is not possible.)
 - (a) $x \equiv 4 \pmod{17}$
 $x \equiv 37 \pmod{73}$
 $x \equiv 57 \pmod{75}$
 - (b) $x \equiv 122 \pmod{169}$
 $x \equiv 31 \pmod{221}$
 - (c) $x \equiv 51 \pmod{112}$
 $x \equiv 89 \pmod{147}$
4. If $2413 \equiv 4142 \pmod{m}$ is a true statement, then what are the possible values of m ?
5. (a) Prove that the last digit of the fifth power of a number is the same as the last digit of that number.
(IE. n^5 and n have the same last digit.)
(b) Prove that all primes except for 2 and 3 are congruent $\pmod{12}$ to one of 1, 5, 7, or 11 $\pmod{12}$.