

**MA383 - Foundations in Mathematics**  
**Homework Assignment 3**  
**Due *in class* Friday, September 19, 2008**

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Remember, your writing and presentation will be graded in addition to the correctness of your solution!

1. Complete problem 9a on page 90.
2. This exercise deals with the concept of congruent numbers, which we saw in Section 3.1. It leads you through an experiment to form a conjecture, which you then need to prove.
  - (a) List several integers which are congruent to 3 modulo 7. Take each of these integers and square them.
  - (b) For each integer  $m$  that you listed above, find an integer  $k$  such that  $0 \leq k < 7$  and  $m^2 \equiv k \pmod{7}$ . What do you observe?
  - (c) Based on your work in parts (a) and (b) above, formulate a conjecture about the value of  $m^2$  modulo 7 when  $m \equiv 3 \pmod{7}$ . Start your conjecture with the sentence "Let  $m$  be an integer." and complete it with a conditional statement.
  - (d) Prove your conjecture.
3. Complete Problem 2d on page 104.
4. Complete Problem 3a on page 115.