Math 109 Winter 2015 Homework 7

Due 2/20/15 in HW box in basement of AP&M, by 3pm

Reading

Read Chapters 21-22 and do the end of the chapter exercises (do not write up) as you read along. Note that I will talk about Chapter 20 only very briefly in class; I will just explain how solving a linear congruence amounts to the same thing as solving a linear diophantine equation.

Assigned problems from the text (write up and hand in.)

In the Problems IV which begin on page 225 of the text, do #15(i)(ii), 18.

In the Problems V which begin on page 271 of the text, do #1, 2, 4, 5, 7. In these problems, find a solution which uses the language of congruence, even if there are other solutions. (For example, problem 1 can be done by induction; but there is an easier proof using congruence.)

Additional problems (write up and hand in.)

1. Find all integers $x \in \mathbb{Z}$ satisfying the congruence $165x \equiv 15 \pmod{252}$. (Hint: derive the answer from your solution to #15(i) above.)

2. You find yourself in a strange country where there are only two kinds of coins: a 13 dollar coin and a 7 dollar coin.

(a) If you have to pay a bill of 175 dollars, describe all possible combinations of coins you can use to pay this exact amount with no change needed. Justify your answer.

(b). You have to pay a bill of 50 dollars. Show that you cannot pay this exact amount in coins, but find at least two ways to pay this bill if the cashier gives you change back. Find, with justification, the way to do this for which the amount of change the cashier has to give you back is the smallest possible.