

## 225 PROBLEM SET 1, SPRING 2006

DUE THURSDAY, JANUARY 25

- (1) (60 points) Write the following system of equations in matrix form. For each of them, draw the row picture and the column picture and explain (with both pictures) whether the matrix is singular or regular, and whether the system has zero, one or infinitely many solutions. Then determine the set of solutions.

(a)

$$\begin{aligned}4x + -7y &= 4 \\ -2x + 3.5y &= 2\end{aligned}$$

(b)

$$\begin{aligned}4x + -7y &= 3 \\ -2x + 3.5y &= 7\end{aligned}$$

(c)

$$\begin{aligned}4x + -7y &= 4 \\ -2x + 4y &= 2\end{aligned}$$

(d)

$$\begin{aligned}4x + -7y &= 3 \\ -2x + 4y &= 7\end{aligned}$$

(e)

$$\begin{aligned}y &= 4 \\ 3y &= 12\end{aligned}$$

- (2) (40 points) Write the following system of equation in matrix form:

$$\begin{aligned}2x + y - z &= 4 \\ -4x + 3y + 2z &= 1 \\ 2x + 11y - 3z &= 5.\end{aligned}$$

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*Date:* January 18, 2007.

Then write down the augmented matrix  $[A|b]$ . Use Gauss' algorithm to solve the system (in the augmented matrix form). Make sure the order of your steps is the same we have practiced in class. Write down every step and what you are doing (e.g. "step 1: replace the second row with the sum of row two and 2\* row 1".)

How many solutions does the system have? What does that tell you about the matrix  $A$ ? If you would replace  $b$  with a different vector, how many solutions do you expect the system to have?