

Name: \_\_\_\_\_

## Math 254 Fall 2012 Exam 2b

Please read the following directions:

Please print your name in the space provided, using large letters, as “First LAST”. Books, notes, calculators, and other aids are not permitted on this exam. Please write legibly, with plenty of white space. Please put your answers in the designated areas. Show all necessary work in your solutions; if you are unsure, show it. Cross out work you do not wish graded; incorrect work can lower your grade. All problems are worth 5-10 points; your total will be scaled to the standard 100 point scale. You have approximately 30 minutes.

Extra credit may be earned by handing in revised work in class on Friday 9/21; for details see the syllabus. You will find this exam on the instructor’s webpage soon.

1. Carefully state the definition of “linear function”. Give two examples.

2. What is partial pivoting and why would you use it?

The remaining problems all concern the following system:  
(it is reproduced on the back for convenience)

$$\begin{array}{rcl} 2x_1+3x_2+4x_4 & = & 9 \\ 4x_1+x_2-10x_3+3x_4 & = & -2 \\ -2x_1+2x_2+10x_3+2x_4 & = & 12 \\ -2x_1+x_2+8x_3+2x_4 & = & 9 \\ 4x_1+3x_2-6x_3+x_4 & = & 2 \end{array}$$

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3. Write the system as an augmented matrix. Put this in echelon form, justifying each step. Use this to find the general solution to the system.

4. Beginning with the echelon form from the previous problem, put the augmented matrix in row canonical form, justifying each step. Use this to find the general solution to the system.

5. Solve the related homogeneous system (you may use your previous work). Use this solution and the particular solution  $(1, 1, 1, 1)$  to give the general solution to the original system.

$$\begin{array}{rcl} 2x_1 + 3x_2 + 4x_4 & = & 9 \\ 4x_1 + x_2 - 10x_3 + 3x_4 & = & -2 \\ -2x_1 + 2x_2 + 10x_3 + 2x_4 & = & 12 \\ -2x_1 + x_2 + 8x_3 + 2x_4 & = & 9 \\ 4x_1 + 3x_2 - 6x_3 + x_4 & = & 2 \end{array}$$