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## Math 254 Fall 2011 Exam 2b

Please read the following directions:

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 9/30; for details see the syllabus. You will find this exam on the instructor's webpage later today.

1. Carefully state the definition of "linear equation". Give two examples, each in three variables.

The remaining problems all concern the following system.

$$\begin{aligned}x_1 + 3x_2 + 2x_3 + 4x_4 &= 10 \\2x_1 + 6x_2 + 5x_4 &= 13 \\3x_1 + 9x_2 - 10x_3 &= 2 \\x_1 + 3x_2 - 2x_3 + 6x_4 &= 8 \\2x_3 - x_4 &= 1\end{aligned}$$

2. Write the above system as a matrix equation.

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3. Write the above system as an augmented matrix. Put this in echelon form, justifying each step using elementary row operations. Using the echelon form, find the general solution to the system.

4. Write the above system as an augmented matrix. Put this in row canonical form, justifying each step using elementary row operations. Using the row canonical form, find the general solution to the system.

5. Write the homogeneous system associated to the above system. Use the solution to this homogeneous system, together with the particular solution  $(1, 1, 1, 1)$  to give the general solution to the original system.