Math. 362-01
Summer, 2005
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Second Exam
Thursday, June 30, 2005

This exam is closed book. Make sure your name is on all pages. You should put your work on your own paper, and you may keep this exam sheet upon leaving. Be sure to check your work carefully, and to show intermediate computations in a logical presentation. Each entire problem is worth 25 points.

1. Write down a basis for the row space of the matrix

$$A = \begin{bmatrix} 1 & 1 & 1 & 1 \\ -1 & 1 & -1 & 1 \\ 1 & 2 & 3 & 1 \\ 2 & 5 & 4 & 4 \end{bmatrix}.$$

2. Is the null-space of the matrix A above non-trivial? (That is, does the null space contain any non-zero vectors?) If so, then write down a basis for the null space of this matrix.

3. In each of the following, justify the answers that you give.
   (a) What is the rank of the matrix A?
   (b) What is the dimension of the null space of the matrix A?
   (c) What is the dimension of the column space of the matrix A?

4. Determine whether or not the vector $\begin{pmatrix} 3 & 2 & 5 & 1 \end{pmatrix}^t$ lies in the row space of the matrix A. Show all of your computations and / or write down your reasoning completely.