

TEST FOUR, MA 305  
NOVEMBER 19, 2009. 8:30–9:45

**Print Your Name:**

**Signature**

1. (25 pts) Let  $A$  be the following matrix.

$$\begin{pmatrix} 1 & 2 \\ 2 & 1 \\ 1 & 2 \\ -2 & 2 \end{pmatrix}$$

Find an orthonormal basis for the column space  $\text{CS}(A)$

2. (25 pts) Consider the linear system  $Ax = (3, 1, -1, 2)^T$ , where  $A$  is given in Problem 1. Find the least squares solution.

3. (25 pts) Find the area of the triangle with vertices  $(1, 0, 5)$ ,  $(-2, 1, 3)$ , and  $(0, 1, 3)$ .

4. (25 pts) Let  $A = \begin{bmatrix} 3 & 1 \\ 0 & 2 \end{bmatrix}$ .

- Find all its eigenvalues.
- Find a basis of eigenvectors.
- Decompose  $A$  into the form  $S\Lambda S^{-1}$ .
- Compute  $A^{1000}$ .