Linear Algebra I **Worksheet 2** **Due January 30, 2007**

Name: OUID:

Instructions: Be sure to show as much work as possible, and please make a sincere effort to express your answers clearly and neatly. Please write your answers on your own paper, then staple your pages together using this sheet as a cover sheet. Each problem is worth three points.

1. (§1.3 #12) Consider the following matrices:

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 4 \end{bmatrix} \qquad B = \begin{bmatrix} 1 & 0 \\ 2 & 1 \\ 3 & 2 \end{bmatrix} \qquad C = \begin{bmatrix} 3 & -1 & 3 \\ 4 & 1 & 5 \\ 2 & 1 & 3 \end{bmatrix}$$

$$D = \begin{bmatrix} 3 & -2 \\ 2 & 5 \end{bmatrix} \qquad E = \begin{bmatrix} 2 & -4 & 5 \\ 0 & 1 & 4 \\ 3 & 2 & 1 \end{bmatrix} \qquad F = \begin{bmatrix} -1 & 2 \\ 0 & 4 \\ 3 & 5 \end{bmatrix}$$

If possible, compute: (a) $DA+B$ (b) EC (c) CE (d) $EB+F$ (e) $FC+D$

2. (§1.3 #30) Consider the following linear system:

$$\begin{cases} 2x_1 + 3x_2 - 3x_3 + x_4 + x_5 & = 7 \\ 3x_1 \qquad\quad + 2x_3 \qquad\quad + 3x_5 & = -2 \\ 2x_1 + 3x_2 \qquad\quad - 4x_4 & = 3 \\ \qquad\qquad x_3 + x_4 + x_5 & = 5 \end{cases}$$

(a) Find the coefficient matrix; (b) Write the linear system in matrix form; (c) Find the augmented matrix.

3. (§1.4 #10) Find two different 2×2 matrices A such that $A^2 = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$.

4. (§1.4 #12) Find two different 2×2 matrices A such that $A^2 = O$.

5. (§1.6 #6) Sketch $\mathbf{u} = \begin{bmatrix} -3 \\ 3 \end{bmatrix}$ and $f(\mathbf{u})$, where $f\left(\begin{bmatrix} x \\ y \end{bmatrix}\right) = \begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix}$.

6. (§1.6 #12) Determine whether the vector $\mathbf{w} = \begin{bmatrix} 8 \\ 5 \\ 3 \end{bmatrix}$ is in the range of the matrix transformation $f : \mathbf{R}^2 \to \mathbf{R}^3$ defined by $f(\mathbf{x}) = A\mathbf{x}$, where

$$A = \begin{bmatrix} 1 & 2 \\ 0 & 1 \\ 1 & 1 \end{bmatrix}$$

7. (§1.6 #16) Give a geometric description of the matrix transformation $f : \mathbf{R}^2 \to \mathbf{R}^2$ corresponding to the matrix $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$.