Ma 227 **Exam I** **10/10/07**

Name: ______________________________

Lecture Section: _______ **Recitation Section**:______

I pledge my honor that I have abided by the Stevens Honor System.
____

You may not use a calculator, cell phone, or computer while taking this exam. All work must be shown to obtain full credit. Credit will not be given for work not reasonably supported. When you finish, be sure to sign the pledge.

Score on Problem #1 ________

#2a ________

#2b ________

#3 ________

Total Score ________

1 [25 **pts**.] The matrix

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

has the eigenvalues 3 and –2. For this matrix –2 is a repeated eigenvalue with multiplicity two. Find three linerly independent eigenvectors for A.

2 For the matrix

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

SNB gives: eigenvectors: $\left\{ \begin{bmatrix} -1 \\ 1 \end{bmatrix} \right\} \leftrightarrow -1, \left\{ \begin{bmatrix} 1 \\ 1 \end{bmatrix} \right\} \leftrightarrow 3$

2a [**20 pts**.] Find a general homogeneous solution of

$$\frac{dx_1}{dt} = x_1 + 2x_2$$
$$\frac{dx_2}{dt} = 2x_1 + x_2$$

.

$2b$ $\left[30\ \textbf{pts.}\right]$ Find a general solution of the nonhomogeneous system

$$\frac{dx_1}{dt} = x_1 + 2x_2 - e^t$$
$$\frac{dx_2}{dt} = 2x_1 + x_2 + 3$$

3 $\left[25\ \textbf{pts}.\right]$ Find the function matrix $X^{-1}(t)$ whose value at t is the inverse of the matrix

$$X(t) = \begin{bmatrix} e^{3t} & 1 & t \\ 3e^{3t} & 0 & 1 \\ 9e^{3t} & 0 & 0 \end{bmatrix}$$