Math 544, Summer 2001, Exam 1

PRINT Your Name:_____

There are 10 problems on 5 pages. Each problem is worth 5 points. SHOW your work. $\boxed{CIRCLE}$ your answer. **CHECK** your answer whenever possible. **No Calculators.**

1. Compute $\begin{bmatrix} 1 & 0 & -1 \\ 2 & 1 & 0 \end{bmatrix} \begin{bmatrix} 2 & 3 \\ 4 & 5 \\ 6 & 7 \end{bmatrix}$.

2. Express $v = \begin{bmatrix} 5 \\ 7 \\ 5 \end{bmatrix}$ as a linear combination of $v_1 = \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix}$ and $v_2 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$, if possible.

3. Express $v = \begin{bmatrix} 3 \\ 4 \\ 5 \end{bmatrix}$ as a linear combination of $v_1 = \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix}$ and $v_2 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$, if possible.

4. Consider the following system of linear equations:

$$\begin{array}{rcrcrcl} x_1 & + & x_2 & & & - & x_5 = 1 \\ & & x_2 & +2x_3 & + x_4 & +3x_5 & = 1 \\ x_1 & & & - x_3 & + x_4 & + x_5 & = 0. \end{array}$$

   Write these equations in the form $Ax = b$, where A is a matrix and x and b are column vectors.

5. Find the general solution of the following system of linear equations:

$$\begin{array}{rcrcrcl} x_1 & + & x_2 & & & - & x_5 = 1 \\ & & x_2 & +2x_3 & + x_4 & +3x_5 & = 1 \\ x_1 & & & - x_3 & + x_4 & + x_5 & = 0. \end{array}$$

   Also find **three** particular solutions of this system of equations. **Be sure to check** that all three of your particular solutions really satisfy the original system of linear equations.

6. Find the general solution of the following system of linear equations:

$$\begin{array}{rcl} x_1 & +x_2 & = 4 \\ x_1 & +2x_2 & = 6. \end{array}$$

7. Find the general solution of the following system of linear equations:

$$\begin{array}{rcl} x_1 & +x_2 & = 4 \\ x_1 & +2x_2 & = 6 \\ 5x_1 & +8x_2 & = 26 \end{array}$$

8. Define "span". Use complete sentences.

9. Define "linear combination". Use complete sentences.

10. Find h so that $v = \begin{bmatrix} 3 \\ -5 \\ h \end{bmatrix}$ is in the span of $v_1 = \begin{bmatrix} 1 \\ 3 \\ -1 \end{bmatrix}$ and $v_2 = \begin{bmatrix} -5 \\ -8 \\ 2 \end{bmatrix}$.