SI Session: Sept. 8th, 9th & 11th, 2008
Mondays: 3:00 PM – 4:30 PM
Tuesdays: 1:30 PM – 3:00 PM
Thursdays: 1:30 PM – 3:00 PM
Room 1239 SNAD

Prof. McCurdy : Linear Algebra
Fall 2008
SI Leader : Neil Jody

[1] Solve the following system.

$$\begin{aligned} 3x + 2y - z &= 0 \\ 2x - y + 2z &= -2 \\ -2x + 5y - 3z &= 9 \end{aligned}$$

[2] Express the vector $\begin{bmatrix} 2 \\ 1 \\ 7 \end{bmatrix}$ as a linear combination of the vectors $\begin{bmatrix} -1 \\ 0 \\ 2 \end{bmatrix}$, $\begin{bmatrix} 1 \\ 1 \\ -1 \end{bmatrix}$, and $\begin{bmatrix} 3 \\ 1 \\ 0 \end{bmatrix}$.

[3] Find the value of c that will make the vector $\begin{bmatrix} -7 \\ c \\ -4 \end{bmatrix}$ lie in the span of $\begin{bmatrix} 2 \\ 1 \\ 2 \end{bmatrix}$ and $\begin{bmatrix} -1 \\ 1 \\ 0 \end{bmatrix}$.

[4] Suppose that the RREF of a matrix A is $\begin{bmatrix} 1 & 0 & 0 & 3 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & -2 \\ 0 & 0 & 0 & 0 \end{bmatrix}$. Write the solution set of the equation $A\vec{x} = \vec{0}$ in parametric vector form.

[5] Consider the following system of equations:

$$\begin{aligned} -x &+ y + 2z = 2 \\ 3x &+ y + z = -1 \\ 2x &+ 2y + cz = d \end{aligned}$$

Determine the values of c,d that will insure that the system has

(a) exactly one solution
(b) infinitely many solutions
(c) no solution

[6] Determine each set of vectors spans R^3.

(a) $\begin{bmatrix} -2 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 3 \\ -1 \\ 3 \end{bmatrix}$

(b) $\begin{bmatrix} 1 \\ -1 \\ 0 \end{bmatrix}, \begin{bmatrix} 2 \\ 0 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ 2 \\ 1 \end{bmatrix}$

(c) $\begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix}, \begin{bmatrix} 2 \\ 0 \\ 1 \end{bmatrix}, \begin{bmatrix} 3 \\ -1 \\ 2 \end{bmatrix}, \begin{bmatrix} 2 \\ -2 \\ 2 \end{bmatrix}$

(d) $\begin{bmatrix} -1 \\ -1 \\ 2 \end{bmatrix}, \begin{bmatrix} 3 \\ 1 \\ -1 \end{bmatrix}, \begin{bmatrix} 1 \\ 4 \\ 2 \end{bmatrix}$

[7] Let $\vec{u}=\begin{bmatrix}7\\2\\5\end{bmatrix}$, $\vec{v}=\begin{bmatrix}3\\1\\3\end{bmatrix}$, and $\vec{w}=\begin{bmatrix}6\\1\\0\end{bmatrix}$. It can be shown that $3\vec{u}-5\vec{v}-\vec{w}=\vec{0}$.

Use this fact (and no row operations) to find x_1 and x_2 that satisfy the equation

$$\begin{bmatrix}7 & 3\\2 & 1\\6 & 3\end{bmatrix}\begin{bmatrix}x_1\\x_2\end{bmatrix}=\begin{bmatrix}6\\1\\0\end{bmatrix}.$$

[8] Write the solution set of the given homogeneous system in parametric vector form.

$$\begin{aligned}x_1+3x_2-5x_3&=0\\x_1+4x_2-8x_3&=0\\-3x_1-7x_2+9x_3&=0\end{aligned}$$

[9] Determine if the columns of the matrix form a linearly independent set.
Justify each answer.

(a) $\begin{bmatrix} -4 & -3 & 0 \\ 0 & -1 & 4 \\ 1 & 0 & 3 \\ 5 & 4 & 6 \end{bmatrix}$

(b) $\begin{bmatrix} 1 & -3 & 3 & -2 \\ -3 & 7 & -1 & 2 \\ 0 & 1 & -4 & 3 \end{bmatrix}$

[10] Let $\vec{v}_1 = \begin{bmatrix} 1 \\ -5 \\ -3 \end{bmatrix}, \vec{v}_2 = \begin{bmatrix} -2 \\ 10 \\ 6 \end{bmatrix}, \vec{v}_3 = \begin{bmatrix} 2 \\ -9 \\ h \end{bmatrix}$, (a) for what values of *h* is $\vec{v}_3$ in $\text{Span}\{\vec{v}_1, \vec{v}_2\}$, and (b) for what values of *h* is $\{\vec{v}_1, \vec{v}_2, \vec{v}_3\}$ linearly *dependent*?
Justify each answer.