Math 2418 Linear Algebra Quiz #6
Oct. 17-18, 2001

[10] 1.) Show that the line $\mathbf{x} = t\begin{bmatrix}4\\8\end{bmatrix}$ is a subspace of R^2.

A.) Show that if $\mathbf{v}, \mathbf{w} \in S$, then $\mathbf{v}+\mathbf{w} \in S$

$\mathbf{v} \in S$ implies $\mathbf{v} = t_1\begin{bmatrix}4\\8\end{bmatrix}$ for some real number t_1

$\mathbf{w} \in S$ implies $\mathbf{w} = t_2\begin{bmatrix}4\\8\end{bmatrix}$ for some real number t_2

$$\mathbf{v}+\mathbf{w} = t_1\begin{bmatrix}4\\8\end{bmatrix} + t_2\begin{bmatrix}4\\8\end{bmatrix} = (t_1+t_2)\begin{bmatrix}4\\8\end{bmatrix}$$

Thus $\mathbf{v}+\mathbf{w} \in S$

B.) Show that if $\mathbf{v} \in S$, then $c\mathbf{v} \in S$

$\mathbf{v} \in S$ implies $\mathbf{v} = t_1\begin{bmatrix}4\\8\end{bmatrix}$ for some real number t_1

$$\mathbf{cv} = c(t_1\begin{bmatrix}4\\8\end{bmatrix}) = (ct_1)\begin{bmatrix}4\\8\end{bmatrix}$$

Thus $\mathbf{cv} \in S$

Thus S is a subspace of R^2

[10] 2.) Write $\begin{bmatrix}5\\-4\\-5\end{bmatrix}$ as a linear combination of $\begin{bmatrix}4\\1\\2\end{bmatrix}$, $\begin{bmatrix}1\\2\\3\end{bmatrix}$, and $\begin{bmatrix}6\\5\\8\end{bmatrix}$

$$\begin{bmatrix}4&1&6&5\\1&2&5&-4\\2&3&8&-5\end{bmatrix} \to \begin{bmatrix}1&2&5&-4\\4&1&6&5\\2&3&8&-5\end{bmatrix} \to \begin{bmatrix}1&2&5&-4\\0&-7&-14&21\\0&-1&-2&3\end{bmatrix} \to \begin{bmatrix}1&2&5&-4\\0&-1&-2&3\\0&-7&-14&21\end{bmatrix} \to$$

$$\begin{bmatrix}1&2&5&-4\\0&-1&-2&3\\0&0&0&0\end{bmatrix} \to\to \begin{bmatrix}1&0&1&2\\0&1&2&-3\\0&0&0&0\end{bmatrix}$$

Thus $\begin{bmatrix}x_1\\x_2\\x_3\end{bmatrix} = \begin{bmatrix}2-s\\-3-2s\\s\end{bmatrix}$

Let $s = 0$

Answer 2.) $\begin{bmatrix}5\\-4\\-5\end{bmatrix} = 2\begin{bmatrix}4\\1\\2\end{bmatrix} - 3\begin{bmatrix}1\\2\\3\end{bmatrix} + 0\begin{bmatrix}6\\5\\8\end{bmatrix}$