Math 235 HW #6

Section 2.1 #12, 21

2.2 #5b, 9

2.3 #2

2.1 #12 basis for colspace of $\begin{bmatrix} 2 & 3 & 1 \\ 5 & 2 & 1 \\ 1 & 7 & 2 \\ 6 & -2 & 0 \end{bmatrix}$

$$\begin{bmatrix} 2 & 3 & 1 \\ 5 & 2 & 1 \\ 1 & 7 & 2 \\ 6 & -2 & 0 \end{bmatrix} \longrightarrow \cdots \longrightarrow \begin{bmatrix} 1 & 0 & 1/11 \\ 0 & 1 & 3/11 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

a basis for the colspace is $\left\{ \begin{bmatrix} 2 \\ 5 \\ 1 \\ 6 \end{bmatrix}, \begin{bmatrix} 3 \\ 2 \\ 7 \\ -2 \end{bmatrix} \right\}$

2.1 #21 Is $\{[-1,2,1], [2,-4,3]\}$ lin indep?

$$\begin{bmatrix} -1 & 2 \\ 2 & -4 \\ 1 & 3 \end{bmatrix} \rightarrow \begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 0 & 0 \end{bmatrix},$$ so they <u>are</u> independent.

2.2 #5b basis for the rowspace of $\begin{bmatrix} 5 & -1 & 0 & 2 \\ 1 & 2 & 1 & 0 \\ 3 & 1 & -2 & 4 \\ 0 & 4 & -1 & 2 \end{bmatrix}$

Rowspace is the span of $\left\{ \begin{bmatrix} 5 \\ -1 \\ 0 \\ 2 \end{bmatrix}, \begin{bmatrix} 1 \\ 2 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 3 \\ 1 \\ -2 \\ 4 \end{bmatrix}, \begin{bmatrix} 0 \\ 4 \\ -1 \\ 2 \end{bmatrix} \right\}$, so

$\boxed{\text{NO! wrong problem}}$

we do: $$\begin{bmatrix} 5 & 1 & 3 & 0 \\ -1 & 2 & 1 & 4 \\ 0 & 1 & -2 & -1 \\ 2 & 0 & 4 & 2 \end{bmatrix} \rightarrow \cdots \rightarrow \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix},$$

so $\left\{ \begin{bmatrix} 5 \\ -1 \\ 0 \\ 2 \end{bmatrix}, \begin{bmatrix} 1 \\ 2 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 3 \\ 1 \\ -2 \\ 4 \end{bmatrix}, \begin{bmatrix} 0 \\ 4 \\ -1 \\ 2 \end{bmatrix} \right\}$ is a basis

2.2 #9 Is $\begin{bmatrix} 2 & 0 & 1 \\ 0 & 0 & 4 \\ 2 & 4 & 0 \end{bmatrix}$ invertible? use the rank

$$\begin{bmatrix} 2 & 0 & 1 \\ 0 & 0 & 4 \\ 2 & 4 & 0 \end{bmatrix} \to \dots \to \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$ so the rank is 3,

so it is invertible.

2.3 #2 $T([x_1, x_2, x_3]) = [0,0,0,0]$. Is it linear?

Add: $T(\vec{u}) + T(\vec{v}) = \vec{0} + \vec{0} = \vec{0}$

$T(\vec{u} + \vec{v}) = \vec{0}$ (since T of anything is $\vec{0}$)

so $T(\vec{u}) + T(\vec{v}) = T(\vec{u} + \vec{v})$

Smult $T(k\vec{u}) = \vec{0}$

$kT(\vec{u}) = k \cdot \vec{0} = \vec{0}$

so $T(k\vec{u}) = kT(\vec{u})$

So it is linear!

2.2 #56 Basis for rowspace of $\begin{bmatrix} 0 & 1 & 2 & 1 \\ 2 & 1 & 0 & 2 \\ 0 & 2 & 1 & 1 \end{bmatrix}$

The rowspace is $\text{sp}\left\{ \begin{bmatrix} 0 \\ 1 \\ 2 \\ 1 \end{bmatrix}, \begin{bmatrix} 2 \\ 1 \\ 0 \\ 2 \end{bmatrix}, \begin{bmatrix} 0 \\ 2 \\ 1 \\ 1 \end{bmatrix} \right\}$

$$\begin{bmatrix} 0 & 2 & 0 \\ 1 & 1 & 2 \\ 2 & 0 & 1 \\ 1 & 2 & 1 \end{bmatrix} \to \dots \to \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}$$

so $\left\{ \begin{bmatrix} 0 \\ 1 \\ 2 \\ 1 \end{bmatrix}, \begin{bmatrix} 2 \\ 1 \\ 0 \\ 2 \end{bmatrix}, \begin{bmatrix} 0 \\ 2 \\ 1 \\ 1 \end{bmatrix} \right\}$ is a basis.