Worksheet 2

Name: _____ Score: _____

1. Fill in the blanks in the table:

n vectors in $\mathbb{R}^m$	$m \times n$ Matrix	Linear $f : \mathbb{R}^n \to \mathbb{R}^m$
$\{v_1, \ldots, v_n\}$	_____	_____
linearly indep	_____	_____
$\text{Span}(v_1, \ldots, v_n) = \mathbb{R}^m$	_____	_____
Basis for $\mathbb{R}^m$	_____	_____

2. When is a subset H of vectors in $\mathbb{R}^n$ a subspace? Give three examples of subspaces.

3. Give three ways of checking that a 3×3 matrix A is invertible.

4. Is the set of vectors linearly independent?

$$\begin{bmatrix} -10 \\ -5 \\ -1 \\ -9 \end{bmatrix}, \quad \begin{bmatrix} -10 \\ -8 \\ 6 \\ -3 \end{bmatrix}, \quad \begin{bmatrix} -5 \\ 5 \\ 4 \\ 1 \end{bmatrix}$$

5. Does the set of vectors span $\mathbb{R}^3$?

$$\begin{bmatrix} -5 \\ 5 \\ -4 \end{bmatrix} \quad \begin{bmatrix} -3 \\ -4 \\ -1 \end{bmatrix} \quad \begin{bmatrix} -22 \\ 29 \\ -19 \end{bmatrix} \quad \begin{bmatrix} 19 \\ 2 \\ 11 \end{bmatrix}$$

6. Are the vectors linearly independent?

$$\begin{bmatrix}1\\1\\1\\4\end{bmatrix}, \quad \begin{bmatrix}2\\9\\2\\-3\end{bmatrix}, \quad \begin{bmatrix}-2\\-10\\2\\2\end{bmatrix},$$

7. Find the inverses:

   (a)
   $$\begin{bmatrix}-2 & 5\\-1 & 2\end{bmatrix}$$

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

8. Find a basis for the Column space:

   (a)
   $$\begin{bmatrix}7 & -2 & 1 & -14\\9 & -3 & 0 & -24\\-15 & 5 & -1 & 37\end{bmatrix}$$

   (b)
   $$\begin{bmatrix}-3 & -9 & -45 & -39\\-1 & -3 & -15 & -13\\3 & 6 & 33 & 27\end{bmatrix}$$

9. Find a basis for the null space

   (a)
   $$\begin{bmatrix}-2 & 0 & -2\\26 & 5 & 6\end{bmatrix}$$

   (b)
   $$\begin{bmatrix}-1 & 3 & -1 & -4\\0 & 0 & 1 & 4\\-3 & 9 & 7 & 28\end{bmatrix}$$