Name:
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Date:

Dr. Clontz

MASTERY QUIZ DAY 15 Math 237 – Linear Algebra
Version 5 Fall 2017

Show all work. Answers without work will not receive credit. You may use a calculator, but you must show all relevant work to receive credit for a standard.

Standard V2.	Mark:

Determine if $\begin{bmatrix}0\\0\\2\end{bmatrix}$ can be written as a linear combination of the vectors $\begin{bmatrix}-1\\-9\\15\end{bmatrix}$ and $\begin{bmatrix}1\\5\\-5\end{bmatrix}$.

Solution:

$$\text{RREF}\left(\left[\begin{array}{cc|c}-1 & 1 & 0\\-9 & 5 & 0\\15 & -5 & 2\end{array}\right]\right) = \left[\begin{array}{cc|c}1 & 0 & 0\\0 & 1 & 0\\0 & 0 & 1\end{array}\right]$$

Since this system has no solution, $\begin{bmatrix}0\\0\\2\end{bmatrix}$ cannot be written as a linear combination of the vectors $\begin{bmatrix}-1\\-9\\15\end{bmatrix}$ and $\begin{bmatrix}1\\5\\-5\end{bmatrix}$.

□

Standard S1.	Mark:

Determine if the set of matrices $\left\{\begin{bmatrix}3 & -1\\0 & 4\end{bmatrix}, \begin{bmatrix}1 & 2\\-2 & 1\end{bmatrix}, \begin{bmatrix}3 & -8\\6 & 5\end{bmatrix}\right\}$ is linearly dependent or linearly independent.

Solution:

$$\text{RREF}\left(\begin{bmatrix}3 & 1 & 3\\-1 & 2 & -8\\0 & -2 & 6\\4 & 1 & 5\end{bmatrix}\right) = \begin{bmatrix}1 & 0 & 2\\0 & 1 & -3\\0 & 0 & 0\\0 & 0 & 0\end{bmatrix}$$

Since the reduced row echelon form has a nonpivot column, the vectors are linearly dependent.

□

Standard S3.	Mark:

Let $W = \text{span}\left\{\begin{bmatrix}2 & 0\\-2 & 0\end{bmatrix}, \begin{bmatrix}3 & 1\\3 & 6\end{bmatrix}, \begin{bmatrix}0 & 0\\1 & 1\end{bmatrix}, \begin{bmatrix}1 & 2\\0 & 1\end{bmatrix}\right\}$. Find a basis for this vector space.

Solution:

$$\mathrm{RREF}\left(\begin{bmatrix} 2 & 3 & 0 & 1 \\ 0 & 1 & 0 & 2 \\ -2 & 3 & 1 & 0 \\ 0 & 6 & 1 & 1 \end{bmatrix}\right) = \begin{bmatrix} 1 & 0 & 0 & -\frac{5}{2} \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & -11 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

Thus $\left\{ \begin{bmatrix} 2 & 0 \\ -2 & 0 \end{bmatrix}, \begin{bmatrix} 3 & 1 \\ 3 & 6 \end{bmatrix}, \begin{bmatrix} 0 & 0 \\ 1 & 1 \end{bmatrix} \right\}$ is a basis of W.

□

Standard S4.	Mark:

Let $W = \operatorname{span}\left\{ \begin{bmatrix} 2 \\ 0 \\ 2 \\ 1 \end{bmatrix}, \begin{bmatrix} 3 \\ 1 \\ -1 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ 2 \\ -8 \\ 1 \end{bmatrix} \right\}$. Find the dimension of W.

Solution:

$$\mathrm{RREF}\left(\begin{bmatrix} 2 & 3 & 0 \\ 0 & 1 & 2 \\ 2 & -1 & -8 \\ 1 & 1 & 1 \end{bmatrix}\right) = \begin{bmatrix} 1 & 0 & -3 \\ 0 & 1 & 2 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

Since it has two pivot columns, its dimension is 2.

□

Additional Notes/Marks	