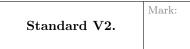
MASTERY QUIZ DAY 13

Math 237 – Linear Algebra Fall 2017

Version 1

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.



Determine if $\begin{bmatrix} 1\\4\\3 \end{bmatrix}$ is a linear combination of the vectors $\begin{bmatrix} 2\\3\\-1 \end{bmatrix}$, $\begin{bmatrix} 1\\-1\\0 \end{bmatrix}$, and $\begin{bmatrix} -3\\-2\\5 \end{bmatrix}$.

Solution:

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

Since this system has a solution, $\begin{bmatrix} 1\\4\\3 \end{bmatrix}$ is a linear combination of the three vectors.

Standard S1.

Mark:

Determine if the set of vectors $\left\{ \begin{bmatrix} 1\\0\\1 \end{bmatrix}, \begin{bmatrix} 1\\2\\-1 \end{bmatrix}, \begin{bmatrix} 1\\3\\-2 \end{bmatrix} \right\}$ is linearly dependent or linearly independent

Solution:

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

Since there is a nonpivot column, the set is linearly dependent.

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Math 237 – Linear Algebra Fall 2017

Version 2 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.

Standar	d 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:

RREF
$$\begin{pmatrix} \begin{bmatrix} -1 & 1 & | & 0 \\ -9 & 5 & | & 0 \\ 15 & -5 & | & 2 \end{bmatrix} \end{pmatrix} = \begin{bmatrix} 1 & 0 & | & 0 \\ 0 & 1 & | & 0 \\ 0 & 0 & | & 1 \end{bmatrix}$$

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 $\begin{bmatrix} 1 \\ 5 \\ -5 \end{bmatrix}$.

Determine if the set of vectors $\left\{ \begin{bmatrix} 1\\0\\1 \end{bmatrix}, \begin{bmatrix} 1\\2\\-1 \end{bmatrix}, \begin{bmatrix} 1\\3\\-2 \end{bmatrix} \right\}$ is linearly dependent or linearly independent

Solution:

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

Since there is a nonpivot column, the set is linearly dependent.

Name:	
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Math 237 – Linear Algebra Fall 2017

Version 3

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	d V2.	Mark:							
Determine if	$\begin{bmatrix} 0 \\ 1 \\ -2 \\ 1 \end{bmatrix} $ can	be writte	en as a linear combination of the vectors	$\begin{bmatrix} 5\\2\\-3\\2 \end{bmatrix}$,	$\begin{bmatrix} 3 \\ 1 \\ 1 \\ 0 \end{bmatrix}$, and	$\begin{bmatrix} 8 \\ 3 \\ 5 \\ -1 \end{bmatrix}$	

Solution:

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

 $\text{RREF}\left(\begin{bmatrix} 8 & 5 & 3 & 0 \\ 3 & 2 & 1 & 1 \\ 5 & -3 & 1 & -2 \\ -1 & 2 & 0 & 1 \end{bmatrix}\right) = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$ The system has no solution, so $\begin{bmatrix} 0 \\ 1 \\ -2 \\ 1 \end{bmatrix}$ is not a linear combination of the three other vectors.

Standard S1.

Determine if the vectors
$$\begin{bmatrix} 1\\1\\-1 \end{bmatrix}$$
, $\begin{bmatrix} 3\\-1\\1 \end{bmatrix}$, and $\begin{bmatrix} 2\\0\\-2 \end{bmatrix}$ are linearly dependent or linearly independent

Solution:

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

Since each column is a pivot column, the vectors are linearly independent.

MASTERY QUIZ DAY 13

Math 237 – Linear Algebra Fall 2017

Version 4

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.

Determine if $\begin{bmatrix} 1\\4\\3 \end{bmatrix}$ is a linear combination of the vectors $\begin{bmatrix} 3\\0\\-1 \end{bmatrix}$, $\begin{bmatrix} 1\\-1\\4 \end{bmatrix}$, and $\begin{bmatrix} 5\\1\\-6 \end{bmatrix}$.

Solution:

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

So $\begin{bmatrix} 1\\4\\3 \end{bmatrix}$ is not a linear combination of the three vectors.

Standard S1.

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

Solution:

RREF
$$\begin{pmatrix} \begin{bmatrix} 3 & 1 & 3 \\ -1 & 2 & -8 \\ 0 & -2 & 6 \\ 4 & 1 & 5 \end{bmatrix} \end{pmatrix} = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & -3 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

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

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Math 237 – Linear Algebra Fall 2017

Version 5

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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:

RREF
$$\begin{pmatrix} \begin{bmatrix} -1 & 1 & | & 0 \\ -9 & 5 & | & 0 \\ 15 & -5 & | & 2 \end{bmatrix} \end{pmatrix} = \begin{bmatrix} 1 & 0 & | & 0 \\ 0 & 1 & | & 0 \\ 0 & 0 & | & 1 \end{bmatrix}$$

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.

Determine if the set of vectors $\left\{ \begin{bmatrix} -3\\8\\0 \end{bmatrix}, \begin{bmatrix} 1\\2\\2 \end{bmatrix}, \begin{bmatrix} 0\\-1\\3 \end{bmatrix} \right\}$ is linearly dependent or linearly independent

Solution: Since $A = \begin{bmatrix} -3 & 1 & 0 \\ -8 & 2 & -1 \\ 0 & 2 & 3 \end{bmatrix}$ has an eigenvalue of 0 (from problem 2) it is not invertible, and therefore the set is linearly dependent.

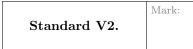
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Date:	

MASTERY QUIZ DAY 13

Math 237 – Linear Algebra Fall 2017

Version 6

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.



Determine if $\begin{bmatrix} 1\\4\\3 \end{bmatrix}$ is a linear combination of the vectors $\begin{bmatrix} 3\\0\\-1 \end{bmatrix}$, $\begin{bmatrix} 1\\-1\\4 \end{bmatrix}$, and $\begin{bmatrix} 5\\1\\-6 \end{bmatrix}$.

Solution:

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

So $\begin{bmatrix} 1 \\ 4 \\ 3 \end{bmatrix}$ is not a linear combination of the three vectors.

Standard S1.

Determine if the set of vectors $\left\{ \begin{bmatrix} -3\\8\\0 \end{bmatrix}, \begin{bmatrix} 1\\2\\2 \end{bmatrix}, \begin{bmatrix} 0\\-1\\3 \end{bmatrix} \right\}$ is linearly dependent or linearly independent

Solution: Since $A = \begin{bmatrix} -3 & 1 & 0 \\ -8 & 2 & -1 \\ 0 & 2 & 3 \end{bmatrix}$ has an eigenvalue of 0 (from problem 2) it is not invertible, and therefore the set is linearly dependent.