Name:

J#:

Date:

# 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 $\begin{bmatrix} 0 \\ -1 \\ 6 \\ -7 \end{bmatrix}$ belongs to the span of the set $\left\{ \begin{bmatrix} 2 \\ 0 \\ -1 \\ 5 \end{bmatrix}, \begin{bmatrix} 4 \\ -1 \\ 4 \\ 3 \end{bmatrix} \right\}$ .

Solution: Since

$$RREF \left( \begin{bmatrix} 2 & 4 & 0 \\ 0 & -1 & -1 \\ -1 & 4 & 6 \\ 5 & 3 & -7 \end{bmatrix} \right) = \begin{bmatrix} 1 & 0 & -2 \\ 0 & 1 & 1 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

does not contain a contradiction,  $\begin{bmatrix} 0\\-1\\6\\-7 \end{bmatrix}$  is a linear combination of the three vectors.

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:

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

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

Name:

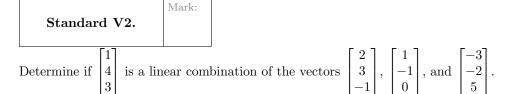
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### MASTERY QUIZ DAY 13

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.



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. 
$$\begin{bmatrix} 1\\1\\-1 \end{bmatrix}, \begin{bmatrix} 3\\-1\\1 \end{bmatrix}, \text{ and } \begin{bmatrix} 2\\0\\-2 \end{bmatrix} \text{ are linearly dependent or linearly independent}$$

Solution:

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

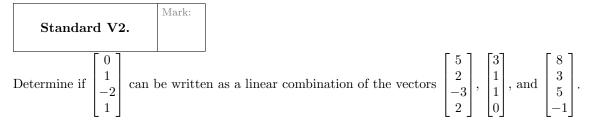
Since each column is a pivot column, the vectors are linearly independent.

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### MASTERY QUIZ DAY 13

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Version 3 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.



Solution:

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

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. 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:

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

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

Name:

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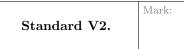
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# MASTERY QUIZ DAY 13

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.



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  $\left\{ \begin{bmatrix} -3\\8\\0 \end{bmatrix}, \begin{bmatrix} 1\\2\\2 \end{bmatrix}, \begin{bmatrix} 0\\-1\\3 \end{bmatrix} \right\}$  is linearly dependent or linearly independent

Solution:

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

This has a non pivot column, therefore the set is linearly dependent.

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### MASTERY QUIZ DAY 13

Math 237 – Linear Algebra Fall 2017

Version 5

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:					
Deter	emine if $\begin{bmatrix} 0 \\ -1 \\ 2 \\ 6 \end{bmatrix}$ or	can be writte	en as a linear combination of the vectors	$\begin{bmatrix} 3 \\ -1 \\ -1 \\ 0 \end{bmatrix}$	and	$\begin{bmatrix} -1\\0\\1\\2 \end{bmatrix}$	

Solution:

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

Since this system has a solution,  $\begin{bmatrix} 0 \\ -1 \\ 2 \\ 6 \end{bmatrix}$  can be written as a linear combination of the vectors  $\begin{bmatrix} 3 \\ -1 \\ -1 \\ 0 \end{bmatrix}$  and

$$\begin{bmatrix} -1\\0\\1\\2 \end{bmatrix}, \text{ namely }$$

$$\begin{bmatrix} 0 \\ -1 \\ 2 \\ 6 \end{bmatrix} = \begin{bmatrix} 3 \\ -1 \\ -1 \\ 0 \end{bmatrix} + 3 \begin{bmatrix} -1 \\ 0 \\ 1 \\ 2 \end{bmatrix}.$$

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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### **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.

Stand	ard V2.	Mark:					
Determine	if $\begin{bmatrix} 0 \\ -1 \\ 2 \\ 6 \end{bmatrix}$ ca	an be writte	n as a linear combination of the vectors	$\begin{bmatrix} 3 \\ -1 \\ -1 \\ 0 \end{bmatrix}$	and	$\begin{bmatrix} -1\\0\\1\\2 \end{bmatrix}$	

**Solution:** 

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

Since this system has a solution,  $\begin{bmatrix} 0 \\ -1 \\ 2 \\ 6 \end{bmatrix}$  can be written as a linear combination of the vectors  $\begin{bmatrix} 3 \\ -1 \\ -1 \\ 0 \end{bmatrix}$  and

$$\begin{bmatrix} -1\\0\\1\\2 \end{bmatrix}, \text{ namely }$$

$$\begin{bmatrix} 0 \\ -1 \\ 2 \\ 6 \end{bmatrix} = \begin{bmatrix} 3 \\ -1 \\ -1 \\ 0 \end{bmatrix} + 3 \begin{bmatrix} -1 \\ 0 \\ 1 \\ 2 \end{bmatrix}.$$

Standard S1.

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:** 

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

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