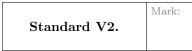
Name:	
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Date:	

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

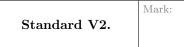
Since this system has a solution,  $\begin{bmatrix} 1 \\ 4 \\ 3 \end{bmatrix}$  is a linear combination of the three vectors.

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Version 2

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

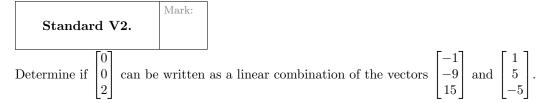
Since this system has a solution,  $\begin{bmatrix} 1 \\ 4 \\ 3 \end{bmatrix}$  is a linear combination of the three vectors.

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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.



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

Additional Notes/Marks

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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  $\begin{bmatrix} 3\\0\\-1 \end{bmatrix}$ ,  $\begin{bmatrix} 1\\-1\\4 \end{bmatrix}$ , and  $\begin{bmatrix} 5\\1\\-6 \end{bmatrix}$ .

Solution:

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

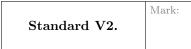
So  $\begin{bmatrix} 1 \\ 4 \\ 3 \end{bmatrix}$  is not a linear combination of the three vectors.

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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.



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

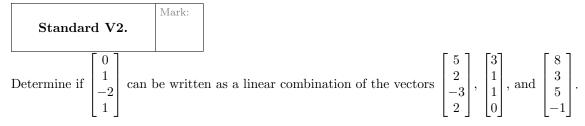
Since this system has a solution,  $\begin{bmatrix} 1 \\ 4 \\ 3 \end{bmatrix}$  is a linear combination of the three vectors.

Additional Notes/Marks

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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.



Solution:

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

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

Additional Notes/Marks