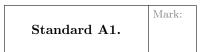
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Math 237 – Linear Algebra Fall 2017

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.



Let $T: \mathbb{R}^4 \to \mathbb{R}^2$ be the linear transformation given by

$$T\left(\begin{bmatrix} x_1\\x_2\\x_3\\x_4\end{bmatrix}\right) = \begin{bmatrix} x_1 + 3x_3\\3x_2 - 5x_3\end{bmatrix}.$$

Write the matrix for T with respect to the standard bases of \mathbb{R}^4 and \mathbb{R}^2 .

Standard A2.

Mark:

Determine if $D: \mathbb{R}^{2\times 2} \to \mathbb{R}$ given by $D\left(\begin{bmatrix} a & b \\ c & d \end{bmatrix}\right) = a - 3c$ is a linear transformation or not.

Let

$$A = \begin{bmatrix} 1 & 3 & -1 \\ 0 & 0 & 7 \end{bmatrix} \qquad B = \begin{bmatrix} 0 & 1 & 7 & 7 \\ -1 & -2 & 0 & 4 \\ 0 & 0 & 1 & 5 \end{bmatrix} \qquad C = \begin{bmatrix} 3 \\ 1 \end{bmatrix}$$

Standard M2.	Ма	rk:			
Determine if the matrix	$\begin{bmatrix} 2 \\ 1 \\ 3 \\ 4 \end{bmatrix}$	$ \begin{array}{c} 1 \\ -1 \\ 2 \\ 1 \end{array} $	$\begin{array}{c} 0 \\ 0 \\ -1 \\ 2 \end{array}$	$\begin{bmatrix} 3 \\ 1 \\ 7 \\ 0 \end{bmatrix}$	is invertible.

Find the inverse of the matrix $\begin{bmatrix} 6 & 0 & 1 \\ -14 & 3 & -4 \\ -23 & 4 & -6 \end{bmatrix}$.

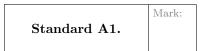
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Version 2

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.



Let $T: \mathbb{R}^3 \to \mathbb{R}$ be the linear transformation given by

Mark:

$$T\left(\begin{bmatrix} x_1\\x_2\\x_3\end{bmatrix}\right) = \begin{bmatrix} x_3 + 3x_1\end{bmatrix}.$$

Write the matrix for T with respect to the standard bases of \mathbb{R}^3 and \mathbb{R} .

Standard A2.

Let $T: \mathbb{R}^2 \to \mathbb{R}^2$ be given by $T\left(\begin{bmatrix} x \\ y \end{bmatrix}\right) = \begin{bmatrix} x+y \\ \sqrt{x}+\sqrt{y} \end{bmatrix}$. Determine if T is a linear transformation.

Let

$$A = \begin{bmatrix} 1 & 3 & -1 & -1 \\ 0 & 0 & 7 & 2 \end{bmatrix} \qquad B = \begin{bmatrix} 0 & 1 & 7 & 7 \\ -1 & -2 & 0 & 4 \\ 0 & 0 & 1 & 5 \end{bmatrix} \qquad C = \begin{bmatrix} 3 & 2 \\ 0 & 1 \\ -2 & -1 \end{bmatrix}$$

Standard M2.	Ма	rk:			
Determine if the matrix	$\begin{bmatrix} 3 \\ 2 \\ 0 \\ 1 \end{bmatrix}$	$ \begin{array}{c} -1 \\ 1 \\ 1 \\ -2 \end{array} $	0 1 1 0	$\begin{bmatrix} 4 \\ -1 \\ 3 \\ 0 \end{bmatrix}$	is invertible.

Standard M3.

Find the inverse of the matrix $\begin{bmatrix} 8 & 5 & 3 & 0 \\ 3 & 2 & 1 & 1 \\ 5 & -3 & 1 & -2 \\ -1 & 2 & 0 & 1 \end{bmatrix}.$

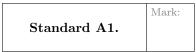
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Version 3

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.



Let $T: \mathbb{R}^4 \to \mathbb{R}^2$ be the linear transformation given by

$$T\left(\begin{bmatrix} x_1\\x_2\\x_3\\x_4\end{bmatrix}\right) = \begin{bmatrix} x_1 + 3x_3\\3x_2 - x_3\end{bmatrix}.$$

Write the matrix for T with respect to the standard bases of \mathbb{R}^4 and \mathbb{R}^2 .

Standard A2.

Mark:

Determine if the map $T: \mathcal{P} \to \mathcal{P}$ given by T(f) = f' - f'' is a linear transformation or not.

Let

$$A = \begin{bmatrix} 1 & 3 & -1 \\ 0 & 0 & 7 \end{bmatrix} \qquad B = \begin{bmatrix} 0 & 1 & 7 & 7 \\ -1 & -2 & 0 & 4 \\ 0 & 0 & 1 & 5 \end{bmatrix} \qquad C = \begin{bmatrix} 3 \\ 1 \end{bmatrix}$$

Standard M2.	Ма	rk:			
Determine if the matrix	$\begin{bmatrix} 2 \\ 1 \\ 3 \\ 4 \end{bmatrix}$	$ \begin{array}{c} 1 \\ -1 \\ 2 \\ 1 \end{array} $	$\begin{array}{c} 0 \\ 0 \\ -1 \\ 2 \end{array}$	$\begin{bmatrix} 3 \\ 1 \\ 7 \\ 0 \end{bmatrix}$	is invertible.

Find the inverse of the matrix $\begin{bmatrix} 6 & 0 & 1 \\ -14 & 3 & -4 \\ -23 & 4 & -6 \end{bmatrix}$.

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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.

Standard A1.

Mark:

Let $T: \mathbb{R}^3 \to \mathbb{R}^4$ be the linear transformation given by

$$T\left(\begin{bmatrix} x \\ y \\ z \end{bmatrix}\right) = \begin{bmatrix} -3x + y \\ -8x + 2y - z \\ 2y + 3z \\ 7x \end{bmatrix}.$$

Write the matrix for T with respect to the standard bases of \mathbb{R}^3 and \mathbb{R}^4 .

Standard A2.

Mark:

Determine if the map $T: \mathcal{P}^3 \to \mathcal{P}^4$ given by T(f(x)) = xf(x) - f(x) is a linear transformation or not.

Let

$$A = \begin{bmatrix} 3 \\ 5 \\ -1 \end{bmatrix} \qquad B = \begin{bmatrix} 2 & -1 \\ 0 & 4 \\ 3 & 1 \end{bmatrix} \qquad C = \begin{bmatrix} 1 & -1 & 3 & -3 \\ 2 & 1 & -1 & 2 \end{bmatrix}$$

Standard M2.	Ма	rk:			
Determine if the matrix	$\begin{bmatrix} 2 \\ 1 \\ 3 \\ 4 \end{bmatrix}$	$ \begin{array}{c} 1 \\ -1 \\ 2 \\ 1 \end{array} $	$0 \\ 3 \\ -1 \\ 2$	$\begin{bmatrix} 3 \\ 1 \\ 7 \\ 0 \end{bmatrix}$	is invertible.

Standard M3.

Find the inverse of the matrix $\begin{bmatrix} 8 & 5 & 3 & 0 \\ 3 & 2 & 1 & 1 \\ 5 & -3 & 1 & -2 \\ -1 & 2 & 0 & 1 \end{bmatrix}.$

 ${\bf Additional\ Notes/Marks}$

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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.

Standard A1.

Mark:

Let $T: \mathbb{R}^3 \to \mathbb{R}$ be the linear transformation given by

$$T\left(\begin{bmatrix} x_1\\x_2\\x_3\end{bmatrix}\right) = \begin{bmatrix} x_3 + 3x_1\end{bmatrix}.$$

Write the matrix for T with respect to the standard bases of \mathbb{R}^3 and \mathbb{R} .

Standard A2.

Mark:

Determine if the map $T: \mathcal{P}^6 \to \mathcal{P}^7$ given by T(f) = xf(x) - f(1) is a linear transformation or not.

Standard M1.

Let

$$A = \begin{bmatrix} 0 & 0 & -1 & -1 \\ 1 & 3 & 7 & 2 \end{bmatrix} \qquad B = \begin{bmatrix} 0 & 1 & 7 & 7 \\ -1 & -2 & 0 & 4 \\ 0 & 0 & 1 & 5 \end{bmatrix} \qquad C = \begin{bmatrix} 3 & 2 \\ 0 & 1 \\ -2 & -1 \end{bmatrix}$$

Exactly one of the six products AB, AC, BA, BC, CA, CB can be computed. Determine which one, and compute it.

Standard M2.	Mark:	
	<u> </u>	

Determine if the matrix $\begin{bmatrix} 1 & 3 & -1 \\ 2 & 7 & 0 \\ -1 & -1 & 5 \end{bmatrix}$ is invertible.

Standard M3.

Compute the inverse of the matrix $\begin{bmatrix} 1 & 2 & 3 & 0 \\ 0 & -1 & 4 & -2 \\ 0 & 0 & 1 & 3 \\ 0 & 0 & 0 & 1 \end{bmatrix}.$

Mark:

$$\text{ix} \begin{bmatrix}
 1 & 2 & 3 & 0 \\
 0 & -1 & 4 & -2 \\
 0 & 0 & 1 & 3 \\
 0 & 0 & 0 & 1
 \end{bmatrix}.$$

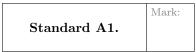
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Math 237 – Linear Algebra Fall 2017

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.



Let $T: \mathbb{R}^3 \to \mathbb{R}^4$ be the linear transformation given by

$$T\left(\begin{bmatrix} x \\ y \\ z \end{bmatrix}\right) = \begin{bmatrix} -3x + y \\ -8x + 2y - z \\ 2y + 3z \\ 7x \end{bmatrix}.$$

Write the matrix for T with respect to the standard bases of \mathbb{R}^3 and \mathbb{R}^4 .

Standard A2.

Mark:

Determine if the map $T: \mathcal{P}^3 \to \mathcal{P}^4$ given by T(f(x)) = xf(x) - f(x) is a linear transformation or not.

Let

$$A = \begin{bmatrix} 3 \\ 5 \\ -1 \end{bmatrix} \qquad B = \begin{bmatrix} 2 & 1 & -1 & 2 \\ 1 & -1 & 3 & -3 \end{bmatrix} \qquad C = \begin{bmatrix} 2 & -1 \\ 0 & 4 \\ 3 & 1 \end{bmatrix}$$

Exactly one of the six products AB, AC, BA, BC, CA, CB can be computed. Determine which one, and compute it.

Standard M2.	Ма	rk:		
etermine if the matrix	$\begin{bmatrix} 3 \\ 2 \end{bmatrix}$	-1 1	$\begin{bmatrix} 0 \\ 1 \end{bmatrix}$	is inve

Determine if the matrix $\begin{bmatrix} 3 & -1 & 0 \\ 2 & 1 & 1 \\ 0 & 1 & 1 \end{bmatrix}$ is invertible.

Standard M3. $\begin{bmatrix} & & & \\ & & &$

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