

Name:
J#:
Date:

Dr. Clontz

# MASTERY QUIZ DAY 23

Math 237 – Linear Algebra

## Version 1

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.

<b>Standard A3.</b>	Mark:
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Determine if each of the following linear transformations is injective (one-to-one) and/or surjective (onto).

(a)  $S : \mathbb{R}^2 \rightarrow \mathbb{R}^4$  given by the standard matrix  $\begin{bmatrix} 2 & 1 \\ 1 & 2 \\ 0 & 1 \\ 3 & -3 \end{bmatrix}$ .

(b)  $T : \mathbb{R}^4 \rightarrow \mathbb{R}^3$  given by the standard matrix  $\begin{bmatrix} 2 & 3 & -1 & 1 \\ -1 & 1 & 1 & 1 \\ 4 & 7 & -1 & 5 \end{bmatrix}$

<b>Standard A4.</b>	Mark:
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Let  $T : \mathbb{R}^4 \rightarrow \mathbb{R}^4$  be the linear transformation given by

$$T \left( \begin{bmatrix} x \\ y \\ z \\ w \end{bmatrix} \right) = \begin{bmatrix} x + 3y + 3z + 7w \\ x + 3y - z - w \\ 2x + 6y + 3z + 8w \\ x + 3y - 2z - 3w \end{bmatrix}$$

Compute a basis for the kernel and a basis for the image of  $T$ .

<b>Additional Notes/Marks</b>	
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#### Version 2

Fall 2017

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<b>Standard A3.</b>	Mark:
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Determine if each of the following linear transformations is injective (one-to-one) and/or surjective (onto).

(a)  $S : \mathbb{R}^2 \rightarrow \mathbb{R}^3$  where  $S(\vec{e}_1) = \begin{bmatrix} 2 \\ 1 \\ 0 \end{bmatrix}$  and  $S(\vec{e}_2) = \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix}$ .

(b)  $T : \mathbb{R}^3 \rightarrow \mathbb{R}^2$  where  $T(\vec{e}_1) = \begin{bmatrix} 2 \\ 2 \end{bmatrix}$ ,  $T(\vec{e}_2) = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$ , and  $T(\vec{e}_3) = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$ .

<b>Standard A4.</b>	Mark:
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Let  $T : \mathbb{R}^4 \rightarrow \mathbb{R}^3$  be the linear map given by  $T\left(\begin{bmatrix} x \\ y \\ z \\ w \end{bmatrix}\right) = \begin{bmatrix} 8x - 3y - z + 4w \\ y + 3z - 4w \\ -7x + 3y + 2z - 5w \end{bmatrix}$ . Compute a basis for the kernel and a basis for the image of  $T$ .

<b>Additional Notes/Marks</b>	
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#### Version 3

Fall 2017

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<b>Standard A3.</b>	Mark:
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Determine if each of the following linear transformations is injective (one-to-one) and/or surjective (onto).

(a)  $T : \mathbb{R}^3 \rightarrow \mathbb{R}^3$  given by  $T \left( \begin{bmatrix} x \\ y \\ z \end{bmatrix} \right) = \begin{bmatrix} x + y + z \\ 2y + 3z \\ x - y - 2z \end{bmatrix}$

(b)  $S : \mathbb{R}^2 \rightarrow \mathbb{R}^3$  given by  $S \left( \begin{bmatrix} x \\ y \end{bmatrix} \right) = \begin{bmatrix} 3x + 2y \\ x - y \\ x + 4y \end{bmatrix}$

<b>Standard A4.</b>	Mark:
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Let  $T : \mathbb{R}^{2 \times 2} \rightarrow \mathbb{R}^3$  be the linear map given by  $T \left( \begin{bmatrix} x & y \\ z & w \end{bmatrix} \right) = \begin{bmatrix} 8x - 3y - z + 4w \\ y + 3z - 4w \\ -7x + 3y + 2z - 5w \end{bmatrix}$ . Compute a basis for the kernel and a basis for the image of  $T$ .

<b>Additional Notes/Marks</b>	
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Math 237 – Linear Algebra

#### Version 4

Fall 2017

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<b>Standard A3.</b>	Mark:
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Determine if each of the following linear transformations is injective (one-to-one) and/or surjective (onto).

(a)  $S : \mathbb{R}^2 \rightarrow \mathbb{R}^3$  where  $S(\vec{e}_1) = \begin{bmatrix} 2 \\ 1 \\ 0 \end{bmatrix}$  and  $S(\vec{e}_2) = \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix}$ .

(b)  $T : \mathbb{R}^3 \rightarrow \mathbb{R}^2$  where  $T(\vec{e}_1) = \begin{bmatrix} 2 \\ 2 \end{bmatrix}$ ,  $T(\vec{e}_2) = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$ , and  $T(\vec{e}_3) = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$ .

<b>Standard A4.</b>	Mark:
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Let  $T : \mathbb{R}^{2 \times 3} \rightarrow \mathbb{R}^3$  be the linear map given by  $T\left(\begin{bmatrix} a & b & c \\ x & y & z \end{bmatrix}\right) = \begin{bmatrix} a+x \\ b+y \\ c+z \end{bmatrix}$ . Compute a basis for the kernel and a basis for the image of  $T$ .

<b>Additional Notes/Marks</b>	
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Math 237 – Linear Algebra

### Version 5

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<b>Standard A3.</b>	Mark:
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Determine if each of the following linear transformations is injective (one-to-one) and/or surjective (onto).

(a)  $S : \mathbb{R}^2 \rightarrow \mathbb{R}^4$  given by the standard matrix  $\begin{bmatrix} 2 & 1 \\ 1 & 2 \\ 0 & 1 \\ 3 & -3 \end{bmatrix}$ .

(b)  $T : \mathbb{R}^4 \rightarrow \mathbb{R}^3$  given by the standard matrix  $\begin{bmatrix} 2 & 3 & -1 & 1 \\ -1 & 1 & 1 & 1 \\ 4 & 11 & -1 & 5 \end{bmatrix}$

<b>Standard A4.</b>	Mark:
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Let  $T : \mathbb{R}^{2 \times 2} \rightarrow \mathbb{R}^3$  be the linear map given by  $T\left(\begin{bmatrix} x & y \\ z & w \end{bmatrix}\right) = \begin{bmatrix} 8x - 3y - z + 4w \\ y + 3z - 4w \\ -7x + 3y + 2z - 5w \end{bmatrix}$ . Compute a basis for the kernel and a basis for the image of  $T$ .

<b>Additional Notes/Marks</b>	
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### MASTERY QUIZ DAY 23

Math 237 – Linear Algebra

#### Version 6

Fall 2017

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<b>Standard A3.</b>	Mark:
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Determine if each of the following linear transformations is injective (one-to-one) and/or surjective (onto).

(a)  $S : \mathbb{R}^2 \rightarrow \mathbb{R}^2$  given by the standard matrix  $\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$ .

(b)  $T : \mathbb{R}^4 \rightarrow \mathbb{R}^3$  given by the standard matrix  $\begin{bmatrix} 2 & 3 & -1 & -2 \\ 0 & 1 & 3 & 1 \\ 2 & 1 & -7 & -4 \end{bmatrix}$

<b>Standard A4.</b>	Mark:
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Let  $T : \mathbb{R}^{2 \times 2} \rightarrow \mathbb{R}^3$  be the linear map given by  $T\left(\begin{bmatrix} x & y \\ z & w \end{bmatrix}\right) = \begin{bmatrix} 8x - 3y - z + 4w \\ y + 3z - 4w \\ -7x + 3y + 2z - 5w \end{bmatrix}$ . Compute a basis for the kernel and a basis for the image of  $T$ .

<b>Additional Notes/Marks</b>	
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