

QUIZ 2

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1. 5 points Use Gaussian elimination to find the inverse of following matrix. Indicate for each step which row operation you use.

$$A = \begin{bmatrix} 1 & 0 & 1 \\ 2 & 4 & 0 \\ 1 & -1 & 1 \end{bmatrix}$$

2. 5 points For which choices of the constant  $k$  is the following matrix invertible?

$$A = \begin{bmatrix} 1 & 1 & 2 \\ 4 & 5 & k^2 \\ -3 & 0 & k \end{bmatrix}$$

3. 5 points Find the matrix  $A$  of the linear transformation  $T: \mathbb{R}^2 \rightarrow \mathbb{R}^2$  with

$$T \begin{bmatrix} 5 \\ 4 \end{bmatrix} = \begin{bmatrix} 6 \\ -2 \end{bmatrix}, \quad T \begin{bmatrix} 3 \\ 2 \end{bmatrix} = \begin{bmatrix} 7 \\ 1 \end{bmatrix}.$$

4. 4 points Sketch the image of the unit square under the linear transformation

$$T(\vec{x}) = \begin{bmatrix} 1 & 3 \\ -2 & 2 \end{bmatrix} \vec{x}$$

5. 6 points Find the matrices of the following linear transformations:

(a)  $T: \mathbb{R}^2 \rightarrow \mathbb{R}^2$ , a clockwise rotation of  $30^\circ$ , followed by a dilation by a factor of 5.

(b)  $T: \mathbb{R}^3 \rightarrow \mathbb{R}^3$ , the reflection in the  $x$ - $z$ -plane, followed by a dilation by a factor of 2.

6. 5 points Find the projection of the vector  $\vec{v} = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$  onto the line  $L$  in the direction of the vector  $\vec{w} = \begin{bmatrix} 4 \\ -3 \end{bmatrix}$ .