Linear Transformations Quiz PDF

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What can be determined from the standard matrix of a linear transformation? (Select all that apply)

- [ ] The effect on the basis vectors
- [ ] The kernel of the transformation
- [ ] The range of the transformation
- [ ] The inverse of the transformation

Which of the following transformations are linear? (Select all that apply)

- [ ] Scaling
- [ ] Translation
- [ ] Rotation
- [ ] Shearing

Describe how a linear transformation can be used to rotate a vector in $\mathbb{R}^2$.

What is the relationship between the kernel and the injectivity of a linear transformation?

What is the result of applying the zero transformation to any vector?

- ◯ The vector itself
- ◯ A unit vector
- ◯ The zero vector
- ◯ A diagonal vector

What is a linear transformation?

- ◯ A function that only scales vectors
- ◯ A function that preserves vector addition and scalar multiplication
- ◯ A function that only rotates vectors
- ◯ A function that maps vectors to matrices

What does the rank of a linear transformation represent?

- ◯ The number of vectors in the kernel
- ◯ The dimension of the range
- ◯ The number of vectors in the domain
- ◯ The dimension of the kernel

Which of the following is a property of linear transformations?

- ◯ Non-linearity
- ◯ Additivity
- ◯ Curvature
- ◯ Non-homogeneity

In image processing, which operation is commonly represented by a linear transformation?

- ◯ Blurring
- ◯ Scaling
- ◯ Cropping

- ◯ Filtering

Discuss the process of finding the eigenvectors and eigenvalues of a matrix and their relevance to linear transformations.

What is the dimension of the kernel of a linear transformation if it is injectIVE?

- ◯ 0
- ◯ 1
- ◯ Equal to the dimension of the domain
- ◯ Equal to the dimension of the codomain

Provide an example of a real-world application of linear transformations and explain its importance.

Which of the following are properties of linear transformations? (Select all that apply)

- ☐ Additivity
- ☐ Homogeneity
- ☐ Non-linearity
- ☐ Communtativity

How does a change of basis affect the matrix representation of a linear transformation?

Which of the following transformations is not linear?

- ◯ Rotation
- ◯ Reflection
- ◯ Translation
- ◯ Scaling

Which of the following are true about the kernel of a linear transformation? (Select all that apply)

- ☐ It contains the zero vector
- ☐ It is a subspace of the domain
- ☐ It is always non-empty
- ☐ It is equal to the range

Which of the following matrices can represent a linear transformation in $\mathbb{R}^2$? (Select all that apply)

- ☐ $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$
- ☐ $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$
- ☐ $\begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$
- ☐ $\begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$

In which scenarios is diagonalization applicable? (Select all that apply)

- ☐ When the matrix is invertible
- ☐ When the matrix has distinct eigenvalues
- ☐ When the matrix is symmetric
- ☐ When the matrix is singular

Which matrix represents the identity transformation in $\mathbb{R}^2$?

- ◯ $\begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$
- ◯ $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

◯ $\begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$
◯ $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$

Explain the significance of the rank-nullity theorem in the context of linear transformations.