Practice Final Exam

This is a preview of the published version of the quiz

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Quiz Instructions

Question 1

1 pts

If $\{v_1, v_2, v_3\}$ is a linearly independent set of vectors in $\mathbf{R}^4$ then
$\{v_1 + v_3, v_2 + v_3, v_3\}$
is linearly independent.

- True
- False

Question 2

1 pts

Suppose A, B, and C are $n \times n$ matrices.

If A is invertible and $AB = AC$, then $B = C$.

- True
- False

Question 3

1 pts

If A is a 6×4 matrix, then the equation $Ax = 0$ must have a non-trivial solution.

- ◯ True
- ◯ False

Question 4

1 pts

If an $n \times n$ matrix A has two eigenvectors u and v corresponding to the same eigenvalue λ, then u must be a scalar multiple of v.

- ◯ True
- ◯ False

Question 5

1 pts

There are exactly two real values of c for which the distance between the vectors v and w in $\mathbf{R}^3$ written below is equal to 4.

$$v = \begin{pmatrix} 1 \\ -2c \\ 1 \end{pmatrix}, \quad w = \begin{pmatrix} -1 \\ 2 \\ -1 \end{pmatrix}$$

- ◯ True
- ◯ False

Question 6

1 pts

Suppose A is an $n \times n$ matrix and v is an eigenvector of A corresponding to the eigenvalue $\lambda = -2$.

Then $2v$ is an eigenvector of A corresponding to the eigenvalue $\lambda = -4$.

- ◯ True
- ◯ False

Question 7

1 pts

Suppose W is a subspace of $\mathbf{R}^n$ and x is a vector in $\mathbf{R}^n$.

If the orthogonal projection of x onto W is the zero vector, then x is in $W^\perp$.

- ◯ True
- ◯ False

Question 8

1 pts

Suppose A is an invertible 3×3 matrix. Then the product of the second row of A and the third column of A^{-1} must equal 0.

- ◯ True
- ◯ False

Question 9

1 pts

If A is an invertible matrix and λ is an eigenvalue of A, then $\dfrac{1}{\lambda}$ is an eigenvalue of A^{-1}.

- ○ True
- ○ False

Question 10

1 pts

Let $T : \mathbf{R}^3 \to \mathbf{R}^2$ be the transformation given by $T(x, y, z) = (x - y - z,\ x - y - z)$.

Which of the following is true about T?

- ○ T is neither one-to-one nor onto.
- ○ T one-to-one but not onto.
- ○ T is onto but not one-to-one.
- ○ T is one-to-one and onto.

Question 11

1 pts

Which one of the following is a subspace of $\mathbf{R}^3$?

- ○ The 1-eigenspace of $\begin{pmatrix} 1 & 0 & 1 \\ 0 & 3 & -1 \\ 0 & 0 & 6 \end{pmatrix}$
- ○ $\text{Nul}\begin{pmatrix} 1 & 0 & 1 & 1 \\ -2 & 3 & -1 & 2 \\ 0 & 0 & 6 & -7 \end{pmatrix}$

- $\mathrm{Col}\begin{pmatrix} 1 & 0 & 1 \\ -2 & 3 & -1 \\ 0 & 0 & 6 \\ -1 & 1 & 0 \end{pmatrix}$
- The set of all (x, y, z) in $\mathbf{R}^3$ satisfying $x - y - z = 1$.
- None of these are subspaces of $\mathbf{R}^3$

Question 12

1 pts

Consider the following matrix A and its reduced row echelon form:

$$A = \begin{pmatrix} 1 & -2 & 4 \\ 0 & 0 & 1 \\ 1 & -2 & 3 \\ -2 & 4 & -8 \end{pmatrix} \xrightarrow{RREF} \begin{pmatrix} 1 & -2 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}.$$

Find a basis for $\mathrm{Nul}(A)$.

- $\left\{ \begin{pmatrix} 1 \\ -2 \\ 0 \end{pmatrix}, \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix} \right\}$
- $\left\{ \begin{pmatrix} 1 \\ 0 \\ 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 0 \\ 1 \\ 0 \\ 0 \end{pmatrix} \right\}$
- $\left\{ \begin{pmatrix} 1 \\ 0 \\ 1 \\ -2 \end{pmatrix}, \begin{pmatrix} 4 \\ 1 \\ 3 \\ -8 \end{pmatrix} \right\}$
- $\left\{ \begin{pmatrix} 2 \\ 1 \\ 0 \end{pmatrix} \right\}$

○ $\left\{\begin{pmatrix} 1 \\ -2 \\ 0 \end{pmatrix}\right\}$

Question 13

1 pts

Suppose A is an invertible 2×2 matrix and $A^{-1}\begin{pmatrix} 1 \\ 3 \end{pmatrix} = \begin{pmatrix} -2 \\ 1 \end{pmatrix}$.

Find the values a and b so that $A\begin{pmatrix} 2 \\ -1 \end{pmatrix} = \begin{pmatrix} a \\ b \end{pmatrix}$.

a =

b =

Question 14

1 pts

Let $T : \mathbf{R}^2 \to \mathbf{R}^2$ be the linear transformation satisfying

$T\begin{pmatrix} 2 \\ 3 \end{pmatrix} = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$ and $T\begin{pmatrix} 4 \\ 0 \end{pmatrix} = \begin{pmatrix} 2 \\ 1 \end{pmatrix}$.

Which one of the following statements is true?

○ T is one-to-one and onto.

○ T is onto but not one-to-one.

○ T is one-to-one but not onto.

○ T is neither one-to-one nor onto

Question 15

1 pts

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

- ○ $T:\mathbf{R}^3 \to \mathbf{R}^3$ defined by $T(x,y,z) = (x, y+1)$.
- ○ $T:\mathbf{R}^2 \to \mathbf{R}^2$ defined by $T(x,y) = (2x - \sin(y), \pi x)$.
- ○ $T:\mathbf{R}^2 \to \mathbf{R}^2$ defined by $T(x,y) = (x\ln(2), y)$.

Question 16

1 pts

Find the numbers a and b so that the following matrix is stochastic.

$$A = \begin{pmatrix} a & 1/3 \\ 1/8 & b \end{pmatrix}.$$

a = [ ]

b = [ ]

Enter each answer as a *fraction*.

Question 17

1 pts

Fill in the blanks:

If A is a 3×7 matrix and B is a 7×4 matrix, then the transformation $T(x) = ABx$ has domain $\mathbf{R}^k$ and codomain $\mathbf{R}^p$,

where k = [ ] and p = [ ] .

Question 18

1 pts

Suppose A and B are 2×2 matrices satisfying $\det(A) = -4, \ \det(B) = 2.$

Find $\det(A^3 B^{-1})$

[ ]

Question 19

1 pts

Suppose that v and w are eigenvectors of A with eigenvalues 3 and -7 respectively. Find $A(2v + 7w)$ in terms of v and w.

$A(2v + 7w) =$ [ ] $v +$ [ ] w.

Question 20

1 pts

Let $A = \begin{pmatrix} 1 & -2 \\ -2 & 1 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 2 & 2 \end{pmatrix}$.

Which statement below is true?

- ◯ A and B are both diagonalizable
- ◯ A is diagonalizable, but B is not diagonalizable
- ◯ B is diagonalizable, but A is not diagonalizable
- ◯ Neither A nor B is diagonalizable

Question 21

1 pts

Suppose $\det \begin{pmatrix} a & b & c \\ d & e & f \\ g & h & i \end{pmatrix} = 3$.

Find $\det \begin{pmatrix} g & h & i \\ d & e & f \\ g-2a & h-2b & i-2c \end{pmatrix}$.

Question 22

1 pts

Suppose that $T : \mathbf{R}^2 \to \mathbf{R}^2$ is a linear transformation satisfying

$T\begin{pmatrix} 2 \\ 3 \end{pmatrix} = \begin{pmatrix} 6 \\ 4 \end{pmatrix}$ and $T\begin{pmatrix} 4 \\ 0 \end{pmatrix} = \begin{pmatrix} 3 \\ -1 \end{pmatrix}$.

Find $T\begin{pmatrix} 2 \\ 1 \end{pmatrix}$.

◯

$\begin{pmatrix} 3 \\ 1 \end{pmatrix}$

- ○ $\begin{pmatrix} 2 \\ 3 \end{pmatrix}$
- ○ $\begin{pmatrix} 9 \\ 3 \end{pmatrix}$
- ○ $\begin{pmatrix} 3 \\ 5 \end{pmatrix}$
- ○ None of these
- ○ $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$
- ○ $\begin{pmatrix} 3 \\ 9 \end{pmatrix}$
- ○ $\begin{pmatrix} -3 \\ -5 \end{pmatrix}$
- ○ $\begin{pmatrix} -5 \\ -3 \end{pmatrix}$

Question 23

1 pts

Let $T : \mathbf{R}^2 \to \mathbf{R}^2$ be the linear transformation of orthogonal projection onto the line $y = -x/4$.

Write the value of c so that $T\begin{pmatrix} 8 \\ c \end{pmatrix} = \begin{pmatrix} 8 \\ c \end{pmatrix}$.

Question 24

1 pts

Let $B = \begin{pmatrix} 7 & -8 \\ 4 & -5 \end{pmatrix}$. Write the eigenvalues of B in increasing order.

The smaller eigenvalue is [ ], and the larger eigenvalue is [ ].

Question 25

1 pts

Let $T : \mathbf{R}^3 \to \mathbf{R}^3$ be the transformation that reflects vectors across the yz-plane, and let A be the standard matrix for T.

Which one of the following statements is true?

- $\dim(\mathrm{Nul}(A - I)) = 2$ and $\dim(\mathrm{Nul}(A + I)) = 1$
- $\dim(\mathrm{Nul}(A - I)) = 1$ and $\dim(\mathrm{Nul}(A + I)) = 2$
- $\dim(\mathrm{Nul}(A - I)) = 1$ and $\dim(\mathrm{Nul}(A + I)) = 1$
- $\dim(\mathrm{Nul}(A)) = 2$ and $\dim(\mathrm{Nul}(A + I)) = 1$
- $\dim(\mathrm{Nul}(A)) = 1$ and $\dim(\mathrm{Nul}(A + I)) = 2$
- None of these

Question 26

1 pts

Select the matrix below whose 7-eigenspace is a line.

- $\begin{pmatrix} 7 & 0 & 0 \\ 1 & 7 & 0 \\ 0 & 1 & 7 \end{pmatrix}$
- $\begin{pmatrix} 7 & 1 & 0 \\ 0 & 7 & 0 \\ 0 & 0 & 7 \end{pmatrix}$
- $\begin{pmatrix} 7 & 0 & 1 \\ 0 & 7 & 0 \\ 0 & 0 & 7 \end{pmatrix}$
- $\begin{pmatrix} 7 & 0 & 1 \\ 0 & 7 & 1 \\ 0 & 0 & 7 \end{pmatrix}$
- $\begin{pmatrix} 7 & 0 & 0 \\ 0 & 7 & 0 \\ 0 & 0 & 7 \end{pmatrix}$
- $\begin{pmatrix} 7 & 0 & 0 \\ 1 & 7 & 0 \\ 0 & 0 & 7 \end{pmatrix}$

Question 27

1 pts

Suppose W is a subspace of $\mathbf{R}^n$ and x is a vector in $\mathbf{R}^n$ satisfying

$$x_W = \begin{pmatrix} 7 \\ 0 \\ 0 \end{pmatrix} \text{ and } x_{W^\perp} = \begin{pmatrix} 0 \\ 3 \\ -4 \end{pmatrix}.$$

What is the distance from x to W?

Question 28

1 pts

Suppose u and v are *orthogonal* vectors in $\mathbf{R}^4$ satisfying $||u|| = 2$ and $||v|| = 3$.

Calculate the dot product $(3u - v) \cdot (2v)$

Question 29

1 pts

Suppose A is a 3×2 matrix, b is a vector, and $\hat{x} = \begin{pmatrix} 4 \\ 0 \end{pmatrix}$ is a least-squares solution to $Ax = b$.

Which one of the following statements must be true?

- $\begin{pmatrix} 4 \\ 0 \end{pmatrix}$ is the orthogonal projection b onto $\mathrm{Col}(A)$.
- $\mathrm{rank}(A) = 2$
- $A\begin{pmatrix} 4 \\ 0 \end{pmatrix}$ is the closest vector to b in $\mathrm{Col}(A)$.
- The closest vector to b in $\mathrm{Col}(A)$ is $\begin{pmatrix} 4 \\ 0 \end{pmatrix}$.

Question 30

1 pts

Let W be the line $x_2 = -3x_1$ in $\mathbf{R}^2$. Find the number a so that the orthogonal projection of $\begin{pmatrix} a \\ 1 \end{pmatrix}$ onto W is the zero vector.

Question 31

1 pts

Suppose a positive stochastic matrix A has 1-eigenspace equal to the span of $\begin{pmatrix} 2 \\ 1 \end{pmatrix}$.

Let $v = \begin{pmatrix} 50 \\ 10 \end{pmatrix}$. As n gets large, $A^n v$ approaches some vector $\begin{pmatrix} a \\ b \end{pmatrix}$. Find a and b.

$a =$

$b =$.

Question 32

1 pts

Let $W = \text{Span}\left\{ \begin{pmatrix} 1 \\ 1 \\ 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 2 \\ 2 \\ 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 0 \\ 0 \\ 1 \\ 0 \end{pmatrix} \right\}$.

Find the dimension of W.

Question 33

1 pts

Select the matrix A that satisfies

$$A\begin{pmatrix}1\\0\\1\end{pmatrix}=\begin{pmatrix}-1\\0\\-1\end{pmatrix},\quad A\begin{pmatrix}0\\1\\2\end{pmatrix}=\begin{pmatrix}0\\2\\4\end{pmatrix},\quad A\begin{pmatrix}0\\1\\0\end{pmatrix}=\begin{pmatrix}0\\-3\\0\end{pmatrix}.$$

- ○ $\begin{pmatrix}1&0&0\\0&1&1\\1&2&0\end{pmatrix}\begin{pmatrix}-1&0&0\\0&2&0\\0&0&-3\end{pmatrix}\begin{pmatrix}1&0&0\\0&1&1\\1&2&0\end{pmatrix}^{-1}$
- ○ $\begin{pmatrix}1&0&0\\0&1&1\\1&2&0\end{pmatrix}\begin{pmatrix}-1&0&0\\0&2&-3\\-1&4&0\end{pmatrix}\begin{pmatrix}1&0&0\\0&1&1\\1&2&0\end{pmatrix}^{-1}$
- ○ $\begin{pmatrix}1&0&1\\0&1&2\\0&1&0\end{pmatrix}\begin{pmatrix}-1&0&0\\0&2&0\\0&0&-3\end{pmatrix}\begin{pmatrix}1&0&1\\0&1&2\\0&1&0\end{pmatrix}^{-1}$
- ○ $\begin{pmatrix}1&0&1\\0&1&2\\0&1&0\end{pmatrix}\begin{pmatrix}-1&0&0\\0&2&0\\0&0&-3\end{pmatrix}^{-1}\begin{pmatrix}1&0&1\\0&1&2\\0&1&0\end{pmatrix}$
- ○ $\begin{pmatrix}1&0&0\\0&1&1\\1&2&0\end{pmatrix}\begin{pmatrix}-1&0&0\\0&2&0\\0&0&-3\end{pmatrix}^{-1}\begin{pmatrix}1&0&0\\0&1&1\\1&2&0\end{pmatrix}$
- ○ None of these

Question 34

1 pts

Find the value of h so that the following set of vectors is linearly dependent.

$$\left\{ \begin{pmatrix} h \\ 2 \\ 1 \end{pmatrix}, \begin{pmatrix} -3 \\ -2 \\ -1 \end{pmatrix}, \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix} \right\}$$

Question 35

1 pts

Suppose $T : \mathbf{R}^m \to \mathbf{R}^n$ and $U : \mathbf{R}^n \to \mathbf{R}^m$ are linear transformations.

Which one of the following statements $must$ be true?

- ◯ The transformation $T \circ U$ has domain $\mathbf{R}^n$ and codomain $\mathbf{R}^n$.
- ◯ If $m > n$, then $T \circ U$ is not onto.
- ◯ U is one-to-one if for every x in $\mathbf{R}^n$, there is a y in $\mathbf{R}^m$ so that $U(x) = y$.

Question 36

1 pts

Some *diagonalizable* 6×6 matrix A has characteristic polynomial

$\det(A - \lambda I) = (4 - \lambda)^3 \lambda^2 (-3 - \lambda)$.

What is the dimension of the null space of A?

- ◯ 2
- ◯ 1
- ◯ 3

- 4
- 5
- 6
- Not enough information to know the answer

Question 37

1 pts

Which one of the following matrices satisfies both of the following conditions?

1. $\mathrm{Col}(A)$ is a subspace of $\mathbf{R}^4$.

2. $\mathrm{Nul}(A)$ is the line $x_2 = 8x_1$ in $\mathbf{R}^2$.

- $$A = \begin{pmatrix} -8 & 1 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \end{pmatrix}$$
- $$A = \begin{pmatrix} 1 & 8 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \end{pmatrix}$$
- $$A = \begin{pmatrix} -8 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 \end{pmatrix}$$
- $$A = \begin{pmatrix} 8 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 \end{pmatrix}$$
- $$A = \begin{pmatrix} 8 & 1 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \end{pmatrix}$$
-

$$A = \begin{pmatrix} 1 & -8 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \end{pmatrix}$$

- none of these

Question 38

1 pts

Let W be subspace of $\mathbf{R}^3$ consisting of all (x, y, z) satisfying $x = y = z$.

What is the dimension of $W^{\perp}$?

Question 39

1 pts

Let $T : \mathbf{R}^2 \to \mathbf{R}^2$ be reflection across the y-axis, let $U : \mathbf{R}^2 \to \mathbf{R}^2$ be rotation counterclockwise by 90 degrees, and let $V : \mathbf{R}^2 \to \mathbf{R}^2$

be reflection across the line $y = -x$.

Which one of the following transformations has standard matrix equal to

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

- $T \circ U$
- $U \circ T$
- $T \circ V$
- $V \circ T$

- $U \circ V$
- $V \circ U$

Question 40

1 pts

Let $A = \begin{pmatrix} -1 & 2 \\ 1 & 1 \\ 2 & -1 \end{pmatrix}$.

Find the value of a so that $(\mathrm{Col}\ A)^{\perp} = \mathrm{Span}\left\{\begin{pmatrix} a \\ -1 \\ 1 \end{pmatrix}\right\}$.

Question 41

1 pts

Suppose A is the matrix that implements reflection across the line $y = -4x$ in $\mathbf{R}^2$. Which of the following statements is true?

- A is invertible and diagonalizable.
- A is invertible but is not diagonalizable.
- A is diagonalizable but not invertible.
- A is neither invertible nor diagonalizable.

Question 42

1 pts

Let W be the subspace of $\mathbf{R}^3$ consisting of all (x, y, z) in $\mathbf{R}^3$ satisfying $x - 3y - z = 0$, and let B be the matrix for orthogonal projection onto W.

Which one of the following statements must be true? If none must be true, select "none of these" as your answer.

- $\text{rank}(B) = 1$
- $B\begin{pmatrix}4\\1\\1\end{pmatrix} = \begin{pmatrix}4\\1\\1\end{pmatrix}$
- $W^{\perp}$ is a plane in $\mathbf{R}^3$
- The 1-eigenspace of B is 1-dimensional.
- None of these

Question 43

1 pts

Suppose A is a 4 x 4 matrix whose entries are real numbers, and suppose $1 + i$ and $2 - i$ are eigenvalues of A.

Which statement below must be true? If none must be true, select "none of these" as your answer.

- A has no real eigenvalues.
- $\det(A) = 0$
- The equation $Ax = b$ is inconsistent for some b in$\mathbf{R}^4$
- A is a positive stochastic matrix.
- none of these

Question 44

1 pts

Which of the following gives least-squares line $y = Cx + D$ for the data points $(0,1)$, $(2,-2)$, and $(3,2)$?

- We get C and D by solving

$$\begin{pmatrix} 0 & 2 & 3 \\ 1 & 1 & 1 \end{pmatrix} \begin{pmatrix} 0 & 1 \\ 2 & 1 \\ 3 & 1 \end{pmatrix} \begin{pmatrix} C \\ D \end{pmatrix} = \begin{pmatrix} 0 & 2 & 3 \\ 1 & 1 & 1 \end{pmatrix} \begin{pmatrix} 1 \\ -2 \\ 2 \end{pmatrix}$$

- We get C and D by solving

$$\begin{pmatrix} 0 & 1 \\ 2 & 1 \\ 3 & 1 \end{pmatrix} \begin{pmatrix} 0 & 2 & 3 \\ 1 & 1 & 1 \end{pmatrix} \begin{pmatrix} C \\ D \end{pmatrix} = \begin{pmatrix} 0 & 2 & 3 \\ 1 & 1 & 1 \end{pmatrix} \begin{pmatrix} 1 \\ -2 \\ 2 \end{pmatrix}$$

- We get C and D by solving

$$\begin{pmatrix} 0 & 1 \\ 2 & 1 \\ 3 & 1 \end{pmatrix} \begin{pmatrix} 0 & 2 & 3 \\ 1 & 1 & 1 \end{pmatrix} \begin{pmatrix} 1 \\ -2 \\ 2 \end{pmatrix} = \begin{pmatrix} 0 & 1 \\ 2 & 1 \\ 3 & 1 \end{pmatrix} \begin{pmatrix} C \\ D \end{pmatrix}$$

- We directly solve

$$\begin{pmatrix} 0 & 1 \\ 2 & 1 \\ 3 & 1 \end{pmatrix} \begin{pmatrix} C \\ D \end{pmatrix} = \begin{pmatrix} 1 \\ -2 \\ 2 \end{pmatrix}$$

- We get C and D by solving

$$\begin{pmatrix} 1 & 2 & -2 \\ 1 & 1 & 1 \end{pmatrix} \begin{pmatrix} 1 & 1 \\ 2 & 1 \\ -2 & 1 \end{pmatrix} \begin{pmatrix} C \\ D \end{pmatrix} = \begin{pmatrix} 1 & 2 & -2 \\ 1 & 1 & 1 \end{pmatrix} \begin{pmatrix} 0 \\ 2 \\ 3 \end{pmatrix}$$

- We get C and D by solving

$$\begin{pmatrix} 1 & 1 & 1 \\ 0 & 2 & 3 \end{pmatrix} \begin{pmatrix} 1 & 0 \\ 1 & 2 \\ 1 & 3 \end{pmatrix} \begin{pmatrix} C \\ D \end{pmatrix} = \begin{pmatrix} 1 & 1 & 1 \\ 0 & 2 & 3 \end{pmatrix} \begin{pmatrix} 1 \\ -2 \\ 2 \end{pmatrix}$$

Question 45

1 pts

Consider an internet with 4 pages.

Page 1 links only to page 2.

Page 2 links to pages 1 and 3.

Page 3 links to pages 2 and 4.

Page 4 links to pages 1, 2, and 3.

What is the importance matrix (also known as Google matrix) for this internet?

- $$A = \begin{pmatrix} 0 & 1/2 & 0 & 1/3 \\ 1 & 0 & 1/2 & 1/3 \\ 0 & 1/2 & 0 & 1/3 \\ 0 & 0 & 1/2 & 0 \end{pmatrix}$$

- $$A = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 1/2 & 0 & 1/2 & 0 \\ 0 & 1/2 & 0 & 1/2 \\ 1/3 & 1/3 & 1/3 & 0 \end{pmatrix}$$

- $$A = \begin{pmatrix} 1 & 1 & 0 & 0 \\ 1/2 & 1 & 1/2 & 0 \\ 0 & 1/2 & 1 & 1/2 \\ 1/3 & 1/3 & 1/3 & 1 \end{pmatrix}$$

- $$A = \begin{pmatrix} 1 & 1/2 & 0 & 1/3 \\ 1 & 1 & 1/2 & 1/3 \\ 0 & 1/2 & 1 & 1/3 \\ 0 & 0 & 1/2 & 1 \end{pmatrix}$$

- $$A = \begin{pmatrix} 1/2 & 1/3 & 0 & 1/4 \\ 1/2 & 1/3 & 1/3 & 1/4 \\ 0 & 1/3 & 1/3 & 1/4 \\ 0 & 0 & 1/3 & 1/4 \end{pmatrix}$$

Question 46

1 pts

Let T be a linear transformation such that $T\begin{pmatrix}1\\1\end{pmatrix} = \begin{pmatrix}1\\0\\-1\end{pmatrix}$ and $T\begin{pmatrix}1\\-1\end{pmatrix} = \begin{pmatrix}0\\-1\\-2\end{pmatrix}$. Then, $T\begin{pmatrix}2\\0\end{pmatrix} = \begin{pmatrix}a\\b\\c\end{pmatrix}$, where $a =$ [ ], $b =$ [ ] and $c =$ [ ].

Question 47

1 pts

What is the determinant of $\begin{pmatrix}1 & 0 & -1 & 0 & 0 & 15\\ 0 & 7 & 5 & 0 & 19 & 0\\ 0 & 0 & -2 & 0 & 0 & 0\\ 0 & 0 & 0 & 1 & 0 & 0\\ 0 & 0 & 0 & 0 & -1 & 0\\ 0 & 0 & 0 & 0 & 0 & -1\end{pmatrix}$?

[ ]

Question 48

1 pts

Suppose that A is a 6x7 matrix and B is a 7x6 matrix such that AB is the 6x6 identity matrix. Is BA equal to the 7x7 identity matrix? [Select]

Question 49

1 pts

Let S be a region in the plane with area 3. Let T be the linear transformation $T(x_1, x_2) = (x_1 + x_2, x_1 - x_2)$. What is the area of $T(S)$?

Question 50

1 pts

You are tasked with uncovering information about a secret matrix, some of whose entries are hidden:

$$A = \begin{pmatrix} -1 & 0 & ? \\ ? & 4 & ? \\ ? & 0 & 0 \end{pmatrix}$$

(the "?" represent hidden entries). Given that $\mathbf{rank}(A) = 2$, how many distinct eigenvalues does A have?

- 0
- 1
- 2
- 3

Not saved Submit Quiz