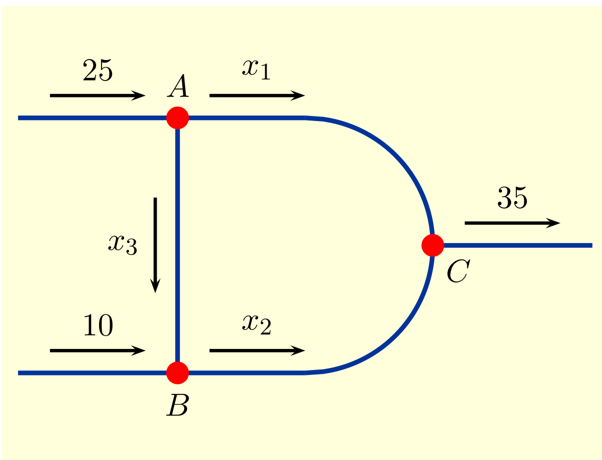
This print-out should have 35 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering.

Network01a
001 10.0 points

The volume of traffic (in average number of vehicles per minute) through three intersections is shown in



Find all possible values for x_2 in terms of a free variable s.

1. $x_2 = 70 + s$

2. $x_2 = 10 + s$

3. $x_2 = -15 + s$

4. $x_2 = 25 + s$

5. $x_2 = 35 + s$

Span02a
002 10.0 points

For each of the following pairs of vectors $\{\mathbf{u}, \mathbf{v}\}$ in $\mathbb{R}^3$ determine whether

$$H = \text{Span}\{\mathbf{u}, \mathbf{v}\}$$

is a line in $\mathbb{R}^3$.

I: $\mathbf{u} = \begin{bmatrix} -2 \\ -1 \\ -1 \end{bmatrix}, \quad \mathbf{v} = \begin{bmatrix} -6 \\ -3 \\ -3 \end{bmatrix},$

II: $\mathbf{u} = \begin{bmatrix} 3 \\ 1 \\ -2 \end{bmatrix}, \quad \mathbf{v} = \begin{bmatrix} 9 \\ -3 \\ -6 \end{bmatrix},$

III: $\mathbf{u} = \begin{bmatrix} -2 \\ 1 \\ 3 \end{bmatrix}, \quad \mathbf{v} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}.$

1. II and III

2. I only

3. III only

4. I and III

5. I and II

6. II only

LinTrans02a
003 10.0 points

If $T : \mathbb{R}^2 \to \mathbb{R}^2$ is the linear transformation such that

$$T\left(\begin{bmatrix} 1 \\ 0 \end{bmatrix}\right) = \begin{bmatrix} 1 \\ -1 \end{bmatrix}, \quad T\left(\begin{bmatrix} 0 \\ 1 \end{bmatrix}\right) = \begin{bmatrix} -2 \\ 2 \end{bmatrix},$$

determine $T(\mathbf{x})$ when $\mathbf{x} = \begin{bmatrix} 3 \\ 1 \end{bmatrix}$.

1. $T(\mathbf{x}) = \begin{bmatrix} 2 \\ -1 \end{bmatrix}$

2. $T(\mathbf{x}) = \begin{bmatrix} 1 \\ -1 \end{bmatrix}$

3. $T(\mathbf{x}) = \begin{bmatrix} 2 \\ -2 \end{bmatrix}$

4. $T(\mathbf{x}) = \begin{bmatrix} 3 \\ 1 \end{bmatrix}$

5. $T(\mathbf{x}) = \begin{bmatrix} 1 \\ -2 \end{bmatrix}$

LinTrans03b
004 10.0 points

Let $T : \mathbb{R}^2 \to \mathbb{R}^2$ be the linear transformation such that

$$T(x_1,\, x_2) \;=\; (4x_1 - 3x_2,\, -x_1 - x_2)\,.$$

Determine A so that T can be written as the matrix transformation $T_A : \mathbb{R}^2 \to \mathbb{R}^2$.

1. $A = \begin{bmatrix} 4 & -3 \\ -1 & -1 \end{bmatrix}$

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

3. $A = \begin{bmatrix} 4 & -1 \\ -3 & -1 \end{bmatrix}$

4. $A = \begin{bmatrix} 4 & 0 & -3 \\ 0 & 1 & -1 \end{bmatrix}$

InverseMatrix03a
005 10.0 points

Determine the product AB^{-1} when

$$A = [\,2\ \ 1\ \ -3\,], \quad B = \begin{bmatrix} 1 & -3 & 1 \\ 2 & -5 & 2 \\ -2 & 3 & -1 \end{bmatrix}.$$

1. $AB^{-1} = [\,12\ \ -8\ \ -3\,]$

2. $AB^{-1} = [\,12\ \ -10\ \ -3\,]$

3. $AB^{-1} = [\,8\ \ -8\ \ -5\,]$

4. $AB^{-1} = [\,8\ \ -10\ \ -5\,]$

5. $AB^{-1} = [\,12\ \ -8\ \ -5\,]$

6. $AB^{-1} = [\,8\ \ -8\ \ -3\,]$

InvertibleTF01c
006 10.0 points

If A is an $n \times n$ matrix, when does the equation $A\mathbf{x} = \mathbf{b}$ have at least one solution for each $\mathbf{b}$ in $\mathbb{R}^n$?

1. ALWAYS

2. SOMETIMES

3. NEVER

LUDecomp05b
007 10.0 points

Determine the unique solution x_2 of the matrix equation

$$A\mathbf{x} = A \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} -5 \\ -4 \\ -9 \end{bmatrix}$$

when A has an LU-decomposition

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

1. $x_2 = -4$

2. $x_2 = -5$

3. $x_2 = -6$

4. $x_2 = -3$

5. $x_2 = -7$

NullSpace01a
008 10.0 points

Find a matrix A so that $\text{Nul}(A)$ is the set of all vectors

$$H = \left\{ \begin{bmatrix} a \\ b \\ c \\ d \end{bmatrix} : \begin{array}{rcl} a+b &=& 2c\,, \\ 3a &=& c+4d\,, \end{array} \right\}$$

in $\mathbb{R}^4$.

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

2. $A = \begin{bmatrix} 1 & 1 & 2 & 0 \\ 3 & 0 & 1 & 4 \end{bmatrix}$

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

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

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

6. $A = \begin{bmatrix} 1 & -1 & 2 & 0 \\ 3 & 0 & -1 & -4 \end{bmatrix}$

Rank02c
009 10.0 points

Determine the rank of the matrix

$$A = \begin{bmatrix} 1 & 2 & 2 \\ -2 & -4 & -5 \\ -2 & -4 & -6 \end{bmatrix}.$$

1. $\text{rank}(A) = 2$

2. $\text{rank}(A) = 1$

3. $\text{rank}(A) = 4$

4. $\text{rank}(A) = 5$

5. $\text{rank}(A) = 3$

SpanningT/F01a
010 10.0 points

Three vectors in $\mathbb{R}^5$ always span $\mathbb{R}^5$. True or False?

1. FALSE

2. TRUE

ComputeDeterminant01
011 10.0 points

Compute the determinant of the following elementary matrix

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & k & 1 \end{bmatrix}.$$

1. k

2. $1 - k$

3. 1

4. $1 + k$

5. 0

DetPropTF01c
012 10.0 points

If the columns of an $n \times n$ matrix A are linearly dependent, then $\det A = 0$.

True or False?

1. TRUE

2. FALSE

SubspaceTF01
013 10.0 points

Let H be the set of points inside and on the unit circle in the xy-plane. That is, let $H = \left\{ \begin{bmatrix} x \\ y \end{bmatrix} : x^2 + y^2 \leq 1 \right\}$.

H is a subspace of $\mathbb{R}^2$. True or false?

1. FALSE

2. TRUE

VectorSubSpaceTF01f
014 10.0 points

The set

$$H = \left\{ \begin{bmatrix} a + 2b \\ a - b \\ 3b \end{bmatrix} : a, b \text{ in } \mathbb{R} \right\}$$

is a subspace of $\mathbb{R}^3$.

True or False?

1. FALSE

2. TRUE

BasisNull02a
015 10.0 points

Find a basis for the Null space of the matrix

$$A = \begin{bmatrix} 3 & 6 & 9 & 12 \\ -2 & -7 & -12 & -17 \\ -3 & -4 & -5 & -6 \end{bmatrix}.$$

1. $\left\{ \begin{bmatrix} -2 \\ 3 \\ 0 \\ 1 \end{bmatrix} \right\}$

2. $\left\{ \begin{bmatrix} 1 \\ -2 \\ 1 \\ 0 \end{bmatrix} \right\}$

3. $\left\{ \begin{bmatrix} -1 \\ 2 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} -2 \\ 3 \\ 0 \\ 1 \end{bmatrix} \right\}$

4. $\left\{ \begin{bmatrix} 1 \\ -2 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 2 \\ -3 \\ 0 \\ 1 \end{bmatrix} \right\}$

5. $\left\{ \begin{bmatrix} 1 \\ 2 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 2 \\ 3 \\ 0 \\ 1 \end{bmatrix} \right\}$

6. $\left\{ \begin{bmatrix} 2 \\ 3 \\ 0 \\ 1 \end{bmatrix} \right\}$

BasisCol01b
016 10.0 points

Find a basis for the column space of the matrix

$$A = \begin{bmatrix} 3 & 6 & -15 & -3 \\ 3 & 9 & -18 & -12 \\ -3 & -8 & 17 & 12 \end{bmatrix}.$$

1. $\left\{ \begin{bmatrix} 3 \\ 3 \\ -3 \end{bmatrix}, \begin{bmatrix} -15 \\ -18 \\ 17 \end{bmatrix}, \begin{bmatrix} -3 \\ -12 \\ 12 \end{bmatrix} \right\}$

2. $\left\{ \begin{bmatrix} -15 \\ -18 \\ 17 \end{bmatrix} \right\}$

3. $\left\{ \begin{bmatrix} 3 \\ 3 \\ -3 \end{bmatrix}, \begin{bmatrix} 6 \\ 9 \\ -8 \end{bmatrix} \right\}$

4. $\left\{ \begin{bmatrix} 6 \\ 9 \\ -8 \end{bmatrix}, \begin{bmatrix} -15 \\ -18 \\ 17 \end{bmatrix} \right\}$

5. $\left\{ \begin{bmatrix} -3 \\ -12 \\ 12 \end{bmatrix} \right\}$

6. $\left\{ \begin{bmatrix} 3 \\ 3 \\ -3 \end{bmatrix}, \begin{bmatrix} 6 \\ 9 \\ -8 \end{bmatrix}, \begin{bmatrix} -3 \\ -12 \\ 12 \end{bmatrix} \right\}$

LinIndSetsTF01b
017 10.0 points

When $\mathbf{b}_1, \mathbf{b}_2, \ldots, \mathbf{b}_p$ are vectors in $\mathbb{R}^n$ and

$$H = \operatorname{Span}\{\mathbf{b}_1, \mathbf{b}_2, \ldots, \mathbf{b}_p\},$$

then $\{\mathbf{b}_1, \mathbf{b}_2, \ldots, \mathbf{b}_p\}$ is a basis for H.

True or False?

1. TRUE

2. FALSE

CoordVec02a
018 10.0 points

Find the vector $\mathbf{x}$ in $\mathbb{R}^3$ having coordinate vector

$$[\mathbf{x}]_{\mathcal{B}} = \begin{bmatrix} -4 \\ 8 \\ -7 \end{bmatrix}$$

with respect to the basis

$$\mathcal{B} = \left\{ \begin{bmatrix} -1 \\ 2 \\ 0 \end{bmatrix}, \begin{bmatrix} 3 \\ -5 \\ 2 \end{bmatrix}, \begin{bmatrix} 4 \\ -7 \\ 3 \end{bmatrix} \right\}$$

for $\mathbb{R}^3$.

1. no such $\mathbf{x}$ exists

2. $\mathbf{x} = \begin{bmatrix} 0 \\ -1 \\ 5 \end{bmatrix}$

3. $\mathbf{x} = \begin{bmatrix} 1 \\ -1 \\ 5 \end{bmatrix}$

4. $\mathbf{x} = \begin{bmatrix} 1 \\ 1 \\ -5 \end{bmatrix}$

5. $\mathbf{x} = \begin{bmatrix} 0 \\ 1 \\ -5 \end{bmatrix}$

DimensionTF04d
019 10.0 points

Let V be a vector space. If dim $V = n$ and if S spans V, then S is a basis for V.

True or False?

1. TRUE

2. FALSE

RankTF03
020 10.0 points

When A is a 5×7 matrix, the largest possible dimension of the row space of A is 5.

True or False?

1. TRUE

2. FALSE

ChangeBasis01b
021 (part 1 of 2) 10.0 points

Determine the change of coordinates matrix $P_{\mathcal{C}\leftarrow\mathcal{B}}$ from basis $\mathcal{B} = \{\mathbf{b}_1, \mathbf{b}_2\}$ to $\mathcal{C} = \{\mathbf{c}_1, \mathbf{c}_2\}$ of a vector space V when

$$\mathbf{b}_1 = 6\mathbf{c}_1 - 2\mathbf{c}_2, \qquad \mathbf{b}_2 = 9\mathbf{c}_1 - 4c_2 .$$

1. $P_{\mathcal{C}\leftarrow\mathcal{B}} = \begin{bmatrix} -6 & 9 \\ -2 & 4 \end{bmatrix}$

2. $P_{\mathcal{C}\leftarrow\mathcal{B}} = \begin{bmatrix} -9 & 6 \\ -4 & 2 \end{bmatrix}$

3. $P_{\mathcal{C}\leftarrow\mathcal{B}} = \begin{bmatrix} 9 & -6 \\ 4 & -2 \end{bmatrix}$

4. $P_{\mathcal{C}\leftarrow\mathcal{B}} = \begin{bmatrix} 6 & 9 \\ -2 & -4 \end{bmatrix}$

5. $P_{\mathcal{C}\leftarrow\mathcal{B}} = \begin{bmatrix} 9 & 6 \\ -4 & -2 \end{bmatrix}$

6. $P_{\mathcal{C}\leftarrow\mathcal{B}} = \begin{bmatrix} 6 & -9 \\ 2 & -4 \end{bmatrix}$

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022 (part 2 of 2) 10.0 points

Determine $[\mathbf{x}]_{\mathcal{C}}$ when

$$\mathbf{x} = -3\mathbf{b}_1 + 2\mathbf{b}_2 .$$

1. $[\mathbf{x}]_{\mathcal{C}} = \begin{bmatrix} 0 \\ -4 \end{bmatrix}$

2. $[\mathbf{x}]_{\mathcal{C}} = \begin{bmatrix} 2 \\ 0 \end{bmatrix}$

3. $[\mathbf{x}]_{\mathcal{C}} = \begin{bmatrix} 4 \\ 0 \end{bmatrix}$

4. $[\mathbf{x}]_{\mathcal{C}} = \begin{bmatrix} 0 \\ 2 \end{bmatrix}$

5. $[\mathbf{x}]_{\mathcal{C}} = \begin{bmatrix} -4 \\ 0 \end{bmatrix}$

6. $[\mathbf{x}]_{\mathcal{C}} = \begin{bmatrix} 0 \\ -2 \end{bmatrix}$

Eigenspace02a
023 10.0 points

Find a basis for the eigenspace of the matrix

$$A = \begin{bmatrix} 1 & 3 & 3 \\ -3 & -5 & -3 \\ 3 & 3 & 1 \end{bmatrix},$$

corresponding to the eigenvalue $\lambda = -2$.

1. $\begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix}$

2. $\begin{bmatrix} -1 \\ 1 \\ 0 \end{bmatrix}$

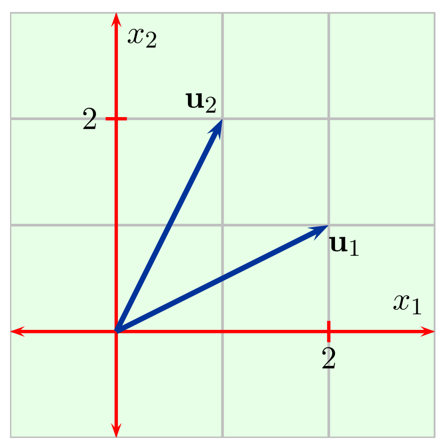
3. $\begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix}, \begin{bmatrix} -1 \\ 0 \\ 1 \end{bmatrix}$

4. $\begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix}, \begin{bmatrix} -1 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} -1 \\ 0 \\ 1 \end{bmatrix}$

5. $\begin{bmatrix} -1 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} -1 \\ 0 \\ 1 \end{bmatrix}$

EigenTrans01a
024 10.0 points

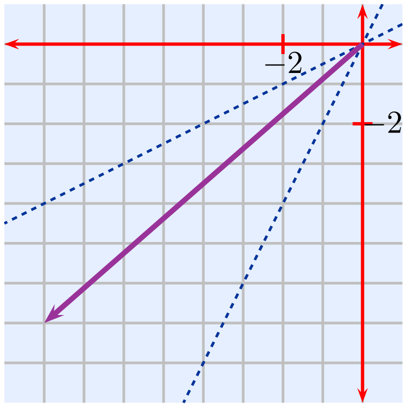
The vectors $\mathbf{u}_1$ and $\mathbf{u}_2$ shown in



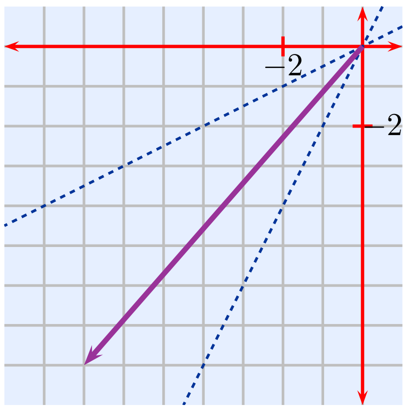
are eigenvectors corresponding to eigenvalues $\lambda_1 = -2$ and $\lambda_2 = -3$ respectively for a 2×2 matrix A.

Which of the following graphs contains the vector $A(\mathbf{u}_1 + \mathbf{u}_2)$?

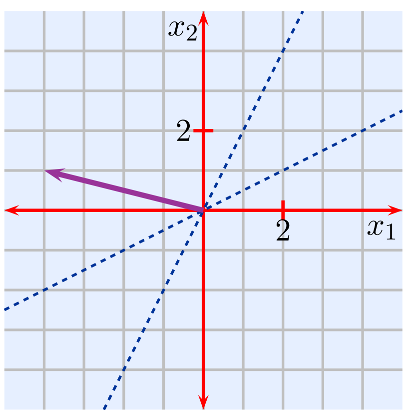
1.



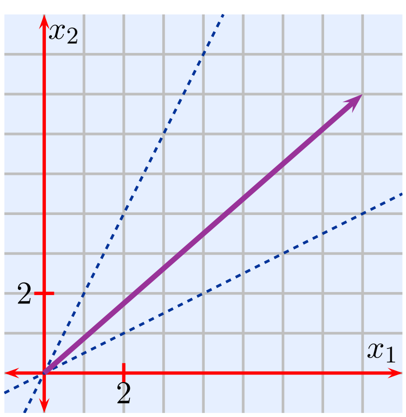
2.



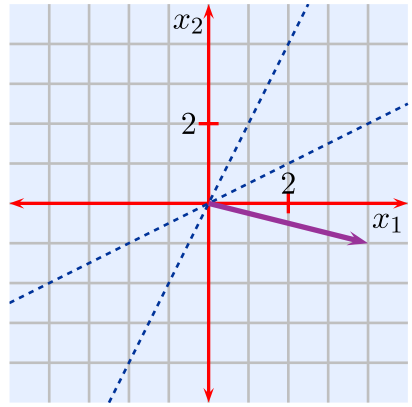
3.



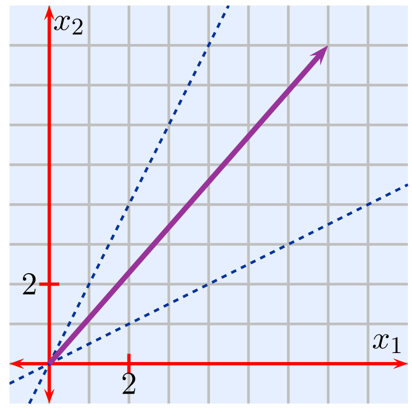
4.



5.



6.



EigenvalueTF02a
025 10.0 points

If A is an $n \times n$ matrix and $A\mathbf{x} = \lambda\mathbf{x}$ for some scalar λ, then $\mathbf{x}$ is an eigenvector of A.

True or False?

1. FALSE

2. TRUE

Eigenvalue04a
026 (part 1 of 2) 10.0 points

Determine the Characteristic Polynomial of the matrix

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

1. $4 - 10\lambda + 6\lambda^2 - \lambda^3$

2. $6 + 10\lambda - 6\lambda^2 + \lambda^3$

3. $6 - 10\lambda + 6\lambda^2 + \lambda^3$

4. $4 - 4\lambda + 10\lambda^2 - \lambda^3$

5. $4 + 4\lambda - 10\lambda^2 - \lambda^3$

6. $6 + 4\lambda \quad 10\lambda^2 + \lambda^3$

027 (part 2 of 2) 10.0 points

One eigenvalue of the matrix A in part (i) is $\lambda = 2$. Determine all the other eigenvalues.

1. $\lambda = 1 \pm 2\sqrt{2}$

2. $\lambda = 2\sqrt{2} \pm 2$

3. $\lambda = 2 \pm \sqrt{2}$

4. $\lambda = 1 \pm \sqrt{2}$

5. $\lambda = 2 \pm 2\sqrt{2}$

6. $\lambda = 2\sqrt{2} \pm 1$

Diagonalize03a
028 10.0 points

Find a matrix P so that

$$P \begin{bmatrix} d_1 & 0 \\ 0 & d_2 \end{bmatrix} P^{-1}, \quad d_1 \geq d_2$$

is a diagonalization of the matrix

$$A = \begin{bmatrix} 9 & 4 \\ -8 & -3 \end{bmatrix}$$

1. $P = \begin{bmatrix} -1 & 1 \\ -2 & 1 \end{bmatrix}$

2. $P = \begin{bmatrix} 1 & -1 \\ -1 & 2 \end{bmatrix}$

3. $P = \begin{bmatrix} 1 & 2 \\ 1 & 1 \end{bmatrix}$

4. $P = \begin{bmatrix} -1 & 1 \\ -1 & 2 \end{bmatrix}$

5. $P = \begin{bmatrix} -1 & 2 \\ 1 & -1 \end{bmatrix}$

6. $P = \begin{bmatrix} -1 & 1 \\ 2 & -1 \end{bmatrix}$

DotProdOrthoTF01b
029 10.0 points

For $\mathbf{u}$ and $\mathbf{v}$ in $\mathbb{R}^n$ and any scalar c,

$$\mathbf{u} \cdot (c\mathbf{v}) = c(\mathbf{u} \cdot \mathbf{v})$$

True or False?

1. FALSE

2. TRUE

OrthoProj04a
030 10.0 points

Determine the vector $\mathbf{z}$ in $\mathbb{R}^3$ such that $\mathbf{y}-\mathbf{z}$ is the projection of $\mathbf{y}$ in Span($\mathbf{u}$) when

$$\mathbf{y} = \begin{bmatrix} -3 \\ -1 \\ 10 \end{bmatrix}, \qquad \mathbf{u} = \begin{bmatrix} 1 \\ -1 \\ 2 \end{bmatrix}.$$

1. $\mathbf{z} = \begin{bmatrix} -9 \\ 3 \\ 6 \end{bmatrix}$

2. $\mathbf{z} = \begin{bmatrix} 9 \\ -3 \\ -6 \end{bmatrix}$

3. $\mathbf{z} = \begin{bmatrix} 6 \\ -2 \\ -4 \end{bmatrix}$

4. $\mathbf{z} = \begin{bmatrix} -6 \\ 2 \\ 4 \end{bmatrix}$

OrthogProj01a
031 10.0 points

Determine the orthogonal projection of

$$\mathbf{y} = \begin{bmatrix} -6 \\ -9 \\ -3 \end{bmatrix}$$

onto the subspace W of $\mathbb{R}^3$ spanned by

$$\mathbf{u}_1 = \begin{bmatrix} -2 \\ 2 \\ 1 \end{bmatrix}, \quad \mathbf{u}_2 = \begin{bmatrix} 1 \\ 2 \\ -2 \end{bmatrix}.$$

1. $\operatorname{proj}_W \mathbf{y} = \begin{bmatrix} -1 \\ -8 \\ 5 \end{bmatrix}$

2. $\operatorname{proj}_W \mathbf{y} = \begin{bmatrix} 0 \\ -8 \\ 3 \end{bmatrix}$

3. $\operatorname{proj}_W \mathbf{y} = \begin{bmatrix} -1 \\ -6 \\ 3 \end{bmatrix}$

4. $\operatorname{proj}_W \mathbf{y} = \begin{bmatrix} 0 \\ -6 \\ 3 \end{bmatrix}$

GramSchmidt04a
032 10.0 points

Find an orthogonal basis for the column space of A when

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

1. $\mathbf{v}_1 = \begin{bmatrix} 0 \\ 1 \\ -1 \end{bmatrix}, \quad \mathbf{v}_2 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$

2. $\mathbf{v}_1 = \begin{bmatrix} 0 \\ 1 \\ -1 \end{bmatrix}, \quad \mathbf{v}_2 = \begin{bmatrix} -3 \\ 2 \\ 1 \end{bmatrix}.$

3. $\mathbf{v}_1 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}, \quad \mathbf{v}_2 = \begin{bmatrix} -3 \\ 2 \\ 1 \end{bmatrix}$

4. $\mathbf{v}_1 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}, \quad \mathbf{v}_2 = \begin{bmatrix} -2 \\ 1 \\ 1 \end{bmatrix}$

5. $\mathbf{v}_1 = \begin{bmatrix} 0 \\ 1 \\ -1 \end{bmatrix}, \quad \mathbf{v}_2 = \begin{bmatrix} -2 \\ 1 \\ 1 \end{bmatrix}$

LeastSquares02a
033 10.0 points

Find the least-squares solution of $A\mathbf{x} = \mathbf{b}$ when

$$A = \begin{bmatrix} -3 & -2 & 0 \\ 2 & 1 & 0 \\ -1 & 0 & 1 \end{bmatrix}, \quad \mathbf{b} = \begin{bmatrix} 2 \\ -6 \\ 2 \end{bmatrix}.$$

1. $\begin{bmatrix} 4 \\ 19 \\ 10 \end{bmatrix}$

2. $\begin{bmatrix} -10 \\ 14 \\ -8 \end{bmatrix}$

3. $\begin{bmatrix} -20 \\ -10 \\ 2 \end{bmatrix}$

4. $\begin{bmatrix} 2 \\ -6 \\ 2 \end{bmatrix}$

5. $\begin{bmatrix} -4 \\ 21 \\ 11 \end{bmatrix}$

RegressionLine01a
034 10.0 points

Find the x-intercept of the Least Squares Regression line $y = mx + b$ that best fits the data points

$$(-1,\,3), \quad (0,\,-2), \quad (1,\,5)\,.$$

OrthogDiag01b
035 10.0 points

When

$$\mathbf{u}_1 = \begin{bmatrix} 2 \\ -1 \end{bmatrix}, \qquad \mathbf{u}_2 = \begin{bmatrix} 1 \\ 2 \end{bmatrix},$$

are eigenvectors of a symmetric 2×2 matrix A corresponding to eigenvalues

$$\lambda_1 = 7, \qquad \lambda_2 = -13,$$

find matrices D and P in an orthogonal diagonalization of A.