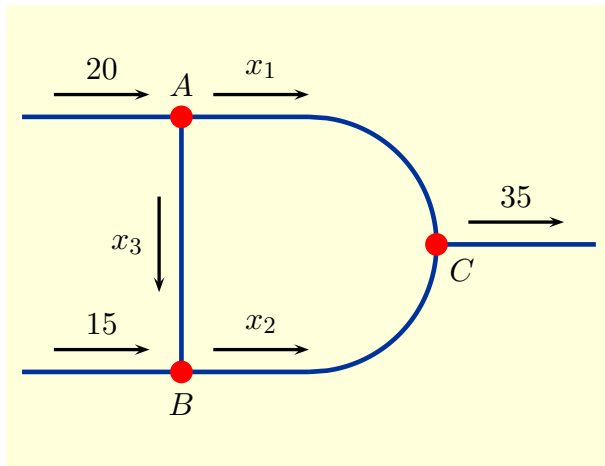This print-out should have 35 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering.

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. $x_2 = -5 + s$

3. $x_2 = 35 + s$

4. $x_2 = 15 + s$

5. $x_2 = 20 + s$

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: $\mathbf{u} = \begin{bmatrix} 2 \\ -1 \\ 3 \end{bmatrix}, \quad \mathbf{v} = \begin{bmatrix} -4 \\ 2 \\ -6 \end{bmatrix},$

II: $\mathbf{u} = \begin{bmatrix} 3 \\ 1 \\ -2 \end{bmatrix}, \quad \mathbf{v} = \begin{bmatrix} -6 \\ 2 \\ 4 \end{bmatrix},$

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

1. I and II

2. I only

3. I and III

4. II only

5. III only

6. II and III

LinTrans02a
003   10.0 points

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

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

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

1. $T(\mathbf{x}) = \begin{bmatrix} 7 \\ -6 \end{bmatrix}$

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

3. $T(\mathbf{x}) = \begin{bmatrix} 8 \\ -5 \end{bmatrix}$

4. $T(\mathbf{x}) = \begin{bmatrix} 8 \\ -6 \end{bmatrix}$

5. $T(\mathbf{x}) = \begin{bmatrix} 7 \\ -5 \end{bmatrix}$

LinTrans03b
004   10.0 points

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

$$T(x_1,\, x_2) \;=\; (4x_1 - 2x_2,\; -x_1 - 2x_2)\,.$$

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

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

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

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

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

InverseMatrix03a
005   10.0 points

Determine the product AB^{-1} when

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

1. $AB^{-1} = \begin{bmatrix} 1 & -3 & -3 \end{bmatrix}$

2. $AB^{-1} = \begin{bmatrix} 3 & -9 & -2 \end{bmatrix}$

3. $AB^{-1} = \begin{bmatrix} 1 & -3 & -2 \end{bmatrix}$

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

5. $AB^{-1} = \begin{bmatrix} 1 & -9 & -3 \end{bmatrix}$

6. $AB^{-1} = \begin{bmatrix} 3 & 3 & 2 \end{bmatrix}$

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. NEVER

3. SOMETIMES

LUDecomp05b
007   10.0 points

Determine the unique solution x_2 of the matrix equation

$$A\mathbf{x} = A \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 4 \\ 2 \\ 12 \end{bmatrix}$$

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. $x_2 = 3$

2. $x_2 = 2$

3. $x_2 = 6$

4. $x_2 = 5$

5. $x_2 = 4$

NullSpace01a
008   10.0 points

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

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

in $\mathbb{R}^4$.

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

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

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

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

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

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

SpanningT/F01a
010   10.0 points

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

1. FALSE

2. TRUE

Rank02c
009   10.0 points

Determine the rank of the matrix

$$A = \begin{bmatrix} 1 & 1 & -2 \\ 3 & 3 & -5 \\ 2 & 2 & -6 \end{bmatrix}.$$

1. rank$(A) = 3$

2. rank$(A) = 1$

3. rank$(A) = 4$

4. rank$(A) = 2$

5. rank$(A) = 5$

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. 0

2. 1

3. $1 + k$

4. k

5. $1 \quad k$

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 $H = \left\{ \begin{bmatrix} x \\ y \end{bmatrix} : x^2 + y^2 \le 1 \right\}$.

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

1. TRUE

2. FALSE

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

$$A = \begin{bmatrix} 2 & -4 & 0 & 10 \\ 2 & -6 & 2 & 16 \\ 2 & -7 & 3 & 19 \end{bmatrix}.$$

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

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

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

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

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

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

BasisCol01b
016   10.0 points

Find a basis for the column space of the matrix

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

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

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

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

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

5. $\left\{ \begin{bmatrix} 6 \\ -3 \\ -3 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix} \right\}$

6. $\left\{ \begin{bmatrix} 3 \\ -1 \\ -1 \end{bmatrix}, \begin{bmatrix} 6 \\ -3 \\ -3 \end{bmatrix} \right\}$

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

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

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

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

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

LinIndSetsTF01b
017   10.0 points

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

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

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

1. FALSE

2. TRUE

CoordVec02a
018   10.0 points

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

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

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. FALSE

2. TRUE

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

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

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

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

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

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

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

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

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

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

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

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

Eigenspace02a
023   10.0 points
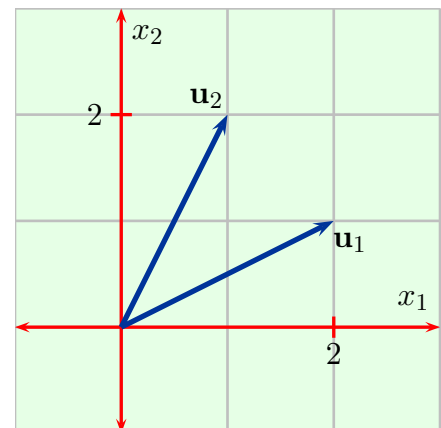
Find a basis for the eigenspace of the matrix

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

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

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

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

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

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

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

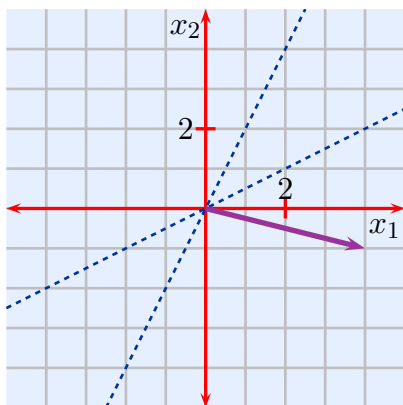---

EigenTrans01a
024   10.0 points

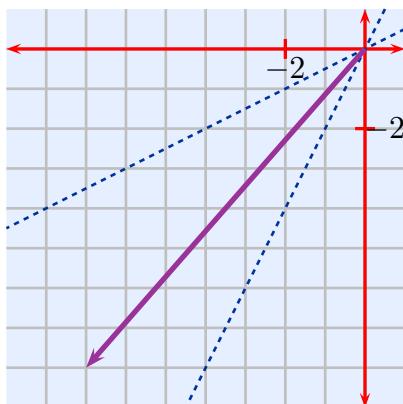The vectors $\mathbf{u}_1$ and $\mathbf{u}_2$ shown in

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

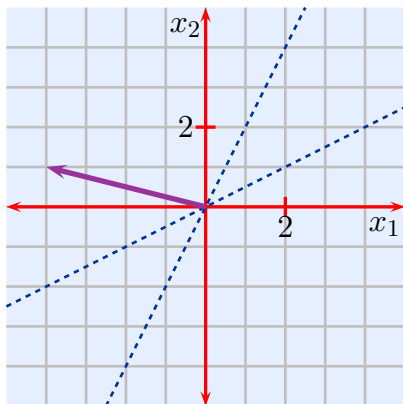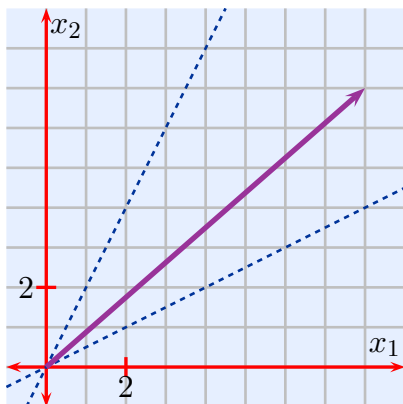Which of the following graphs contains the vector $A(\mathbf{u}_1 + \mathbf{u}_2)$?
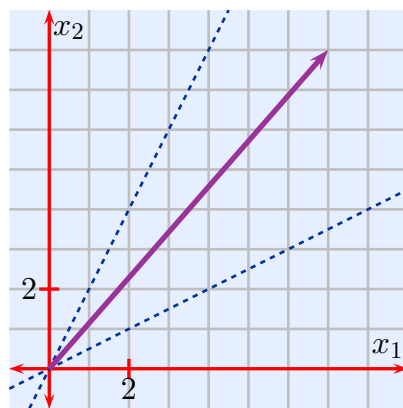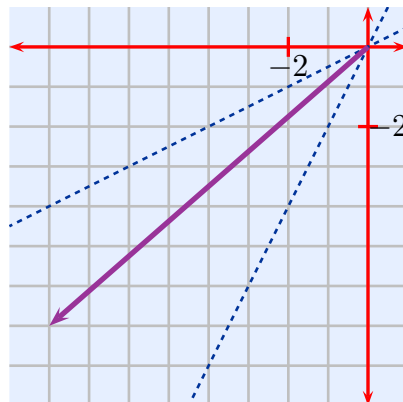
1.

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. TRUE

2. FALSE

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

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

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

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

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

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

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

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

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

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

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

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

$$A = \begin{bmatrix} -3 & -6 \\ 0 & -5 \end{bmatrix}$$

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

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

3. $P = \begin{bmatrix} -5 & -1 \\ -1 & 3 \end{bmatrix}$

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

5. $P = \begin{bmatrix} -3 & -1 \\ 1 & -5 \end{bmatrix}$

6. $P = \begin{bmatrix} 1 & 3 \\ 0 & -1 \end{bmatrix}$

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. TRUE

2. FALSE

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 $\text{Span}(\mathbf{u})$ when

$$\mathbf{y} \;=\; \begin{bmatrix} 9 \\ 5 \\ 2 \end{bmatrix}, \qquad \mathbf{u} \;=\; \begin{bmatrix} 1 \\ 1 \\ 2 \end{bmatrix}.$$

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

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

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

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

OrthogProj01a
031   10.0 points

Determine the orthogonal projection of

$$\mathbf{y} \;=\; \begin{bmatrix} 5 \\ 1 \\ -10 \end{bmatrix}$$

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

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

1. $\text{proj}_W \mathbf{y} \;=\; \begin{bmatrix} 3 \\ -6 \\ 0 \end{bmatrix}$

2. $\text{proj}_W \mathbf{y} \;=\; \begin{bmatrix} 7 \\ -6 \\ -8 \end{bmatrix}$

3. $\mathrm{proj}_W \mathbf{y} = \begin{bmatrix} 7 \\ 2 \\ -8 \end{bmatrix}$

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

2. $\mathbf{v}_1 = \begin{bmatrix} 6 \\ -2 \\ -1 \end{bmatrix}, \quad \mathbf{v}_2 = \begin{bmatrix} 1 \\ 2 \\ 2 \end{bmatrix}$

3. $\mathbf{v}_1 = \begin{bmatrix} 1 \\ 2 \\ 2 \end{bmatrix}, \quad \mathbf{v}_2 = \begin{bmatrix} 2 \\ 13 \\ -14 \end{bmatrix}$

4. $\mathbf{v}_1 = \begin{bmatrix} 6 \\ -2 \\ -1 \end{bmatrix}, \quad \mathbf{v}_2 = \begin{bmatrix} 2 \\ 13 \\ -14 \end{bmatrix}$

5. $\mathbf{v}_1 = \begin{bmatrix} 6 \\ -2 \\ -1 \end{bmatrix}, \quad \mathbf{v}_2 = \begin{bmatrix} -20 \\ -7 \\ 17 \end{bmatrix}.$

GramSchmidt04a
032   10.0 points

Find an orthogonal basis for the column space of A when

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

1. $\mathbf{v}_1 = \begin{bmatrix} 1 \\ 2 \\ 2 \end{bmatrix}, \quad \mathbf{v}_2 = \begin{bmatrix} -20 \\ -7 \\ 17 \end{bmatrix}$

LeastSquares02a
033   10.0 points

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

$$A = \begin{bmatrix} 1 & 1 & 1 \\ 0 & 0 & 1 \\ 0 & -1 & 1 \end{bmatrix}, \quad \mathbf{b} = \begin{bmatrix} -2 \\ 2 \\ -5 \end{bmatrix}.$$

1. $\begin{bmatrix} -19 \\ -13 \\ 19 \end{bmatrix}$

2. $\begin{bmatrix} -11 \\ 7 \\ 2 \end{bmatrix}$

3. $\begin{bmatrix} -2 \\ 3 \\ -5 \end{bmatrix}$

4. $\begin{bmatrix} -2 \\ 2 \\ -5 \end{bmatrix}$

5. $\begin{bmatrix} -23 \\ -9 \\ -13 \end{bmatrix}$

RegressionLine01a
034   10.0 points

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

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

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

$$\lambda_1 = -1, \qquad \lambda_2 = -11,$$

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