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

FitParabola01a
001 10.0 points

The graph of the function

$$y = ax^2 + bx + c$$

is a parabola passing through the points

$$(1,\, 16), \quad (-1,\, 6), \quad (-3,\, 12).$$

Find the y-intercept of this parabola.

1. y-intercept $=$ 11

2. y-intercept $=$ 10

3. y-intercept $=$ 12

4. y-intercept $=$ 9

5. y-intercept $=$ 8

EchelonForm01e
002 10.0 points

If the augmented matrix for a system of linear equations in variables x_1, x_2, and x_3 is row equivalent to the matrix

$$B = \begin{bmatrix} 3 & -6 & 3 & 15 \\ -1 & 2 & 2 & 4 \\ 1 & -2 & 2 & 8 \end{bmatrix},$$

determine x_1.

1. $x_1 = 2 + 2t\,, \quad t$ arbitrary

2. $x_1 = -1$

3. system inconsistent

4. $x_1 = 3 + 2t\,, \quad t$ arbitrary

5. $x_1 = 2$

6. $x_1 = 3$

4. $\lambda = 1,\ 5$

5. $\lambda = 1,\ -1$

6. $\lambda = 1$

M340LSpanM02
003 10.0 points

Given

$$\mathbf{v_1} = \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}, \quad \mathbf{v_2} = \begin{bmatrix} 2 \\ 4 \\ 2 \end{bmatrix}, \quad \mathbf{v_3} = \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix},$$

determine all values of λ for which

$$\mathbf{w} = \begin{bmatrix} 2 \\ 3 \\ \lambda \end{bmatrix}$$

is a vector in Span$\{\mathbf{v_1}, \mathbf{v_2}, \mathbf{v_3}\}$?

1. $\lambda = -1$

2. $\lambda = 5$

3. $\lambda = -1,\ 5$

MatEquTF03
004 10.0 points

If A is an $m \times n$ matrix and the equation $A\mathbf{x} = \mathbf{b}$ is consistent for some $\mathbf{b}$ in $\mathbb{R}^m$, then the columns of A span $\mathbb{R}^m$.

True or False?

1. FALSE

2. TRUE

1. # molecules = 60

2. # molecules = 51

3. # molecules = 54

4. # molecules = 57

5. # molecules = 63

BalChemEqt02a
005 10.0 points

During photosynthesis green plants convert carbon dioxide CO_2 and water H_2O into glucose $C_6H_{12}O_6$ and oxygen O_2, represented chemically by

$$CO_2 + H_2O \longrightarrow C_6H_{12}O_6 + O_2 .$$

If 9 molecules of glucose were produced in one particular conversion, how many molecules of carbon dioxide were used?

SpanTF04
006 10.0 points

If $\mathbf{u}$, $\mathbf{v}$, and $\mathbf{w}$ are nonzero vectors in $\mathbb{R}^2$ and $\mathbf{u}$ is not a multiple of $\mathbf{v}$, is $\mathbf{w}$ a linear combination of $\mathbf{u}$ and $\mathbf{v}$?

1. SOMETIMES

2. NEVER

3. ALWAYS

LinTransform02a
007 10.0 points

If A is an $m \times n$ matrix, then the range of the transformation

$$T : \mathbb{R}^n \to \mathbb{R}^m, \quad T_A : \mathbf{x} \to A\,\mathbf{x}\,,$$

is the set of all linear combinations of the columns of A.

True or False?

1. FALSE

2. TRUE

MatrixTrans02a
008 10.0 points

If $T : \mathbb{R}^3 \to \mathbb{R}^2$ is a linear transformation such that

$$T(\mathbf{e}_1) = \begin{bmatrix} 4 \\ -3 \end{bmatrix}, \quad T(\mathbf{e}_2) = \begin{bmatrix} -1 \\ 2 \end{bmatrix},$$

and $T(\mathbf{e}_3) = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$, determine $T(\mathbf{u})$ when

$$\mathbf{u} = \begin{bmatrix} 2 \\ 3 \\ 1 \end{bmatrix}.$$

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

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

3. $T(\mathbf{u}) = \begin{bmatrix} 6 \\ 1 \end{bmatrix}$

4. $T(\mathbf{u}) = \begin{bmatrix} 7 \\ 1 \end{bmatrix}$

5. $T(\mathbf{u}) = \begin{bmatrix} 7 \\ 2 \end{bmatrix}$

6. $T(\mathbf{u}) = \begin{bmatrix} 6 \\ 2 \end{bmatrix}$

MatrixOpsTF02c
009 10.0 points

If A is an $n \times n$ matrix, then

$$(A^2)^T = (A^T)^2$$

True or False?

1. FALSE

2. TRUE

InverseMatrix05b
010 10.0 points

Evaluate the matrix product $B^{-1}A^T$ when

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

1. $B^{-1}A^T = \begin{bmatrix} 12 & -3 & -1 \\ -11 & -2 & -7 \end{bmatrix}$

2. $B^{-1}A^T = \begin{bmatrix} 4 & -7 \\ 1 & 2 \\ 3 & 1 \end{bmatrix}$

3. $B^{-1}A^T = \begin{bmatrix} 4 & 1 & 3 \\ -7 & 2 & 1 \end{bmatrix}$

4. $B^{-1}A^T = \begin{bmatrix} 4 & 1 & 3 \\ -11 & -2 & -7 \end{bmatrix}$

5. $B^{-1}A^T = \begin{bmatrix} 12 & -7 \\ -3 & 2 \\ -1 & 1 \end{bmatrix}$

6. $B^{-1}A^T = \begin{bmatrix} 12 & -11 \\ -3 & -2 \\ -1 & -7 \end{bmatrix}$

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

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

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

5. $U = \begin{bmatrix} 1 & 0 & 5 & -4 \\ 0 & 0 & 1 & 4 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

6. $U = \begin{bmatrix} 1 & -5 & -2 & 2 \\ 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

InvertibleTF02a
011 10.0 points

If A and D are $n \times n$ matrices such that $AD = I$, then $DA = I$

True or False?

1. TRUE

2. FALSE

LUDecomp06g
012 10.0 points

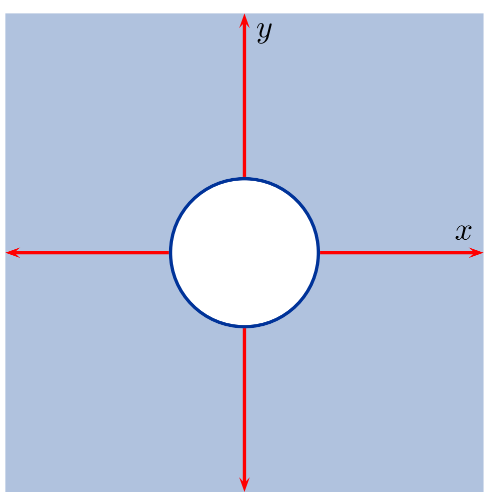
Find U in an LU decomposition of

$$A = \begin{bmatrix} -1 & -5 & -2 & 2 \\ 3 & 15 & 5 & -5 \\ 4 & 20 & 5 & -2 \end{bmatrix}.$$

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

Subspace01cT/F
013 10.0 points

The set of points in the shaded region (including the bounding lines and assumed to stretch to $\pm\infty$ in all directions) shown in



is a subspace of $\mathbb{R}^2$.

True or False?

1. FALSE

2. TRUE

ColNulDimTF01a
014 10.0 points

If A is a 4×5 matrix, then

$$\dim(\mathrm{Col}(A)) + \dim(\mathrm{Nul}(A)) = 5\,.$$

True or False?

1. TRUE

2. FALSE

Determinant02e
015 10.0 points

Compute the determinant of the matrix

$$A = \begin{bmatrix} -3 & 3 & 6 \\ -3 & 6 & 4 \\ -3 & 12 & 2 \end{bmatrix}$$

1. $\det(A) = -16$

2. $\det(A) = -17$

3. $\det(A) = -20$

4. $\det(A) = -18$

5. $\det(A) = -19$

DetMult05
016 10.0 points

Evaluate $\det\left[B^5\right]$ when

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

1. $\det\left[B^5\right] = -2$

2. $\det\left[B^5\right] = 32$

3. $\det\left[B^5\right] = -10$

4. $\det\left[B^5\right] = -32$

5. $\det\left[B^5\right] = 10$

VectorSpaceT/F04a
017 10.0 points

The set H of all polynomials

$$\mathbf{p}(x) = a + bx^2, \quad a, b \text{ in } \mathbb{R},$$

is a subspace of the vector space $\mathbb{P}_6$ of all polynomials of degree at most 6.

True or False?

1. FALSE

2. TRUE

BasisNull02b
018 10.0 points

Find a basis for the Null space of the matrix

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

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

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

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

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

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

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

BasisCol02a
019 10.0 points

First find a basis for Col(A) when

$$A = \begin{bmatrix} 1 & -1 & 1 \\ 3 & -2 & 2 \\ -2 & 0 & 0 \end{bmatrix} = [\mathbf{a}_1 \ \ \mathbf{a}_2 \ \ \mathbf{a}_3],$$

and then select *all* the correct statements from among the following:

I: $\{\mathbf{a}_1, \mathbf{a}_2, \mathbf{a}_3\}$ *is a linearly dependent set.*
II: $\{\mathbf{a}_1, \mathbf{a}_2, \mathbf{a}_3\}$ *is a basis for* $\mathbb{R}^3$.
III: $\text{rank}(A) = 2$.
IV: $\text{nullity}(A) = 1$.
V: $\text{rank}(A) = 3$.

1. I, II, and V

2. I and III

3. II only

4. I, III, and IV

5. II and V

Basis02
020 10.0 points

Find a basis for the space spanned by the following vectors.

$$\begin{bmatrix}1\\0\\0\\1\end{bmatrix}, \begin{bmatrix}-2\\0\\0\\2\end{bmatrix}, \begin{bmatrix}3\\-1\\1\\-1\end{bmatrix}, \begin{bmatrix}5\\-3\\3\\-4\end{bmatrix}, \begin{bmatrix}2\\-1\\1\\0\end{bmatrix}$$

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

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

3. $\left\{\begin{bmatrix}3\\-1\\1\\-1\end{bmatrix}, \begin{bmatrix}5\\-3\\3\\-4\end{bmatrix}, \begin{bmatrix}2\\-1\\1\\0\end{bmatrix}\right\}$

4. $\left\{\begin{bmatrix}1\\0\\0\\1\end{bmatrix}, \begin{bmatrix}5\\-3\\3\\-4\end{bmatrix}, \begin{bmatrix}2\\-1\\1\\0\end{bmatrix}\right\}$

5. $\left\{\begin{bmatrix}-2\\0\\0\\2\end{bmatrix}, \begin{bmatrix}3\\-1\\1\\-1\end{bmatrix}, \begin{bmatrix}5\\-3\\3\\-4\end{bmatrix}\right\}$

CoordVec03a
021 10.0 points

Find the coordinate vector $[\mathbf{x}]_{\mathcal{B}}$ in $\mathbb{R}^3$ for the vector

$$\mathbf{x} = \begin{bmatrix}3\\-5\\4\end{bmatrix}$$

with respect to the basis

$$\mathcal{B} = \left\{\begin{bmatrix}1\\0\\3\end{bmatrix}, \begin{bmatrix}2\\1\\8\end{bmatrix}, \begin{bmatrix}1\\-1\\2\end{bmatrix}\right\}$$

for $\mathbb{R}^3$.

1. $[\mathbf{x}]_{\mathcal{B}} = \begin{bmatrix}0\\-2\\5\end{bmatrix}$

2. $[\mathbf{x}]_{\mathcal{B}} = \begin{bmatrix}0\\2\\5\end{bmatrix}$

3. $[\mathbf{x}]_{\mathcal{B}} = \begin{bmatrix} -5 \\ -2 \\ 0 \end{bmatrix}$

4. $[\mathbf{x}]_{\mathcal{B}} = \begin{bmatrix} 5 \\ 2 \\ 0 \end{bmatrix}$

5. $[\mathbf{x}]_{\mathcal{B}} = \begin{bmatrix} -2 \\ 0 \\ 5 \end{bmatrix}$

6. $[\mathbf{x}]_{\mathcal{B}} = \begin{bmatrix} 2 \\ 0 \\ -5 \end{bmatrix}$

PolySpanVecTF01a
022 10.0 points

The polynomials

$$\mathbf{p}_1 = 1 - 3t + 5t^2, \quad \mathbf{p}_2 = -3 + 5t - 7t^2,$$

and

$$\mathbf{p}_3 = -4 + 5t - 6t^2, \quad \mathbf{p}_4 = 1 - t^2,$$

span $\mathbb{P}_2$.

True or False?

1. TRUE

2. FALSE

1. $P_{\mathcal{C}\leftarrow\mathcal{B}} = \begin{bmatrix} 1 & 2 & 1 \\ 0 & 1 & 2 \\ -3 & -5 & 0 \end{bmatrix}$

2. $P_{\mathcal{C}\leftarrow\mathcal{B}} = \begin{bmatrix} -2 & -1 & -5 \\ 0 & -1 & 2 \\ 3 & -5 & 0 \end{bmatrix}$

3. $P_{\mathcal{C}\leftarrow\mathcal{B}} = \begin{bmatrix} 2 & 5 & 1 \\ 0 & 1 & 2 \\ -3 & -5 & 0 \end{bmatrix}$

4. $P_{\mathcal{C}\leftarrow\mathcal{B}} = \begin{bmatrix} -5 & 2 & 1 \\ 0 & 1 & -2 \\ -3 & -5 & 0 \end{bmatrix}$

5. $P_{\mathcal{C}\leftarrow\mathcal{B}} = \begin{bmatrix} 5 & 2 & 1 \\ 0 & 1 & 2 \\ -3 & -5 & 0 \end{bmatrix}$

6. $P_{\mathcal{C}\leftarrow\mathcal{B}} = \begin{bmatrix} 1 & -2 & 1 \\ 0 & 1 & 2 \\ -3 & 5 & 0 \end{bmatrix}$

RankTF06c
023 10.0 points

The dimensions of the row space and column space of an $m \times n$ matrix A are the same, even if $m \neq n$.

True or False?

1. FALSE

2. TRUE

ChangeBasis04b
024 (part 1 of 2) 10.0 points

In $\mathbb{P}_2$ determine the change of coordinates matrix $P_{\mathcal{C}\leftarrow\mathcal{B}}$ from basis $\mathcal{B} = \{\mathbf{p}_1, \mathbf{p}_2, \mathbf{p}_3\}$ to the standard monomial basis $\mathcal{C} = \{1, t, t^2\}$ when

$$\mathbf{p}_1 = 1 - 3t^2, \quad \mathbf{p}_2 = 2 + t - 5t^2$$

and

$$\mathbf{p}_3 = 1 + 2t\,.$$

025 (part 2 of 2) 10.0 points

Express $\mathbf{q}(t) = t^2$ as a linear combination of the polynomials in the basis $\mathcal{B}$.

1. $\mathbf{q} = 2\mathbf{p}_1 - 3\mathbf{p}_2 + \mathbf{p}_3$

2. $\mathbf{q} = 3\mathbf{p}_1 + 2\mathbf{p}_2 - \mathbf{p}_3$

3. $\mathbf{q} = 2\mathbf{p}_1 + 3\mathbf{p}_2 - \mathbf{p}_3$

4. $\mathbf{q} = 3\mathbf{p}_1 - 2\mathbf{p}_2 + \mathbf{p}_3$

5. $\mathbf{q} = 2\mathbf{p}_1 - 3\mathbf{p}_2 - \mathbf{p}_3$

6. $\mathbf{q} = 3\mathbf{p}_1 + 2\mathbf{p}_2 + \mathbf{p}_3$

Eigenspace02a
026 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. $\begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix}, \quad \begin{bmatrix} -1 \\ 0 \\ 1 \end{bmatrix}$

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

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

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

CharPoly05a
027 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. $6 - 10\lambda + 4\lambda^2 + \lambda^3$

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

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

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

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

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

Diagonalize02a
028 10.0 points

Find a matrix P and d_2, d_3 so that

$$P \begin{bmatrix} 3 & 0 & 0 \\ 0 & d_2 & 0 \\ 0 & 0 & d_3 \end{bmatrix} P^{-1}, \quad d_1 \geq d_2 \geq d_3 ,$$

is a diagonalization of the matrix

$$A = \begin{bmatrix} 3 & 0 & 0 \\ 10 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix}.$$

1. $d_2 = 1,\ d_3 = 0,$

$$P = \begin{bmatrix} 1 & 0 & 0 \\ 5 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}$$

2. $d_2 = 1,\ d_3 = 0,$

$$P = \begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 5 \\ 1 & 0 & 0 \end{bmatrix}$$

3. $d_2 = 0,\ d_3 = -1,$

$$P = \begin{bmatrix} 1 & 0 & 0 \\ 5 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}$$

4. $d_2 = 1,\ d_3 = 0,$

$$P = \begin{bmatrix} 1 & 0 & 0 \\ 5 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

5. $d_2 = 0,\ d_3 = -1,$

$$P = \begin{bmatrix} 1 & 0 & 0 \\ 5 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

6. $d_2 = 0,\ d_3 = -1,$

$$P = \begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 5 \\ 1 & 0 & 0 \end{bmatrix}$$

CalC13c03a
029 10.0 points

Which of the following statements are true for all vectors $\mathbf{a}$, $\mathbf{b}$?

A. $\|\mathbf{a}+\mathbf{b}\|^2 \;=\; \|\mathbf{a}\|^2 + 2\,\mathbf{a}\cdot\mathbf{b} + \|\mathbf{b}\|^2$,

B. $|\mathbf{a}\cdot\mathbf{b}| \;\leq\; \|\mathbf{a}\|\,\|\mathbf{b}\|$,

C. $|\mathbf{a}\cdot\mathbf{b}| = \|\mathbf{a}\|\,\|\mathbf{b}\|,\ \mathbf{a}\neq 0,\ \mathbf{b}\neq 0 \implies$ $\mathbf{a}$ parallel to $\mathbf{b}$.

1. B only

2. all of them

3. A only

4. B and C only

5. A and B only

6. none of them

7. A and C only

8. C only

OrthoBasis01b
030 10.0 points

Determine c_2 so that

$$\mathbf{y} \;=\; c_1\mathbf{u}_1 + c_2\mathbf{u}_2 + c_3\mathbf{u}_3$$

when

$$\mathbf{y} \;=\; \begin{bmatrix} -2 \\ -4 \\ 2 \end{bmatrix}$$

and

$$\mathbf{u}_1 = \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix},\quad \mathbf{u}_2 = \begin{bmatrix} 3 \\ -3 \\ 0 \end{bmatrix},\quad \mathbf{u}_3 = \begin{bmatrix} 0 \\ 0 \\ -4 \end{bmatrix}.$$

1. No value of c_2 exists.

2. $c_2 \;=\; -\dfrac{1}{3}$

3. $c_2 \;=\; -1$

4. $c_2 \;=\; \dfrac{1}{3}$

5. $c_2 \;=\; 0$

6. $c_2 \;=\; 1$

DistanceMC01
031 10.0 points

Find the distance from $\mathbf{y}$ to the plane in $\mathbb{R}^3$ spanned by $\mathbf{u}_1$ and $\mathbf{u}_2$ when

$$\mathbf{y} = \begin{bmatrix} 5 \\ -9 \\ 5 \end{bmatrix}, \quad \mathbf{u}_1 = \begin{bmatrix} -3 \\ -5 \\ 1 \end{bmatrix}, \quad \mathbf{u}_2 = \begin{bmatrix} -3 \\ 2 \\ 1 \end{bmatrix}.$$

1. dist $= 8$

2. dist $= 2\sqrt{5}$

3. dist $= 6$

4. dist $= \sqrt{6}$

5. dist $= 4$

6. dist $= 2\sqrt{10}$

GramSchmidt01a
032 10.0 points

Use the fact that

$$A = \begin{bmatrix} 1 & -4 & 9 & -7 \\ -1 & 2 & -4 & 1 \\ 5 & -6 & 10 & 7 \end{bmatrix} \sim \begin{bmatrix} 1 & 0 & -1 & 5 \\ 0 & -2 & 5 & -6 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

to determine an orthogonal basis for $\mathrm{Col}(A)$.

1. $\begin{bmatrix} 1 \\ -1 \\ 5 \end{bmatrix}, \quad \begin{bmatrix} -4 \\ 1 \\ 1 \end{bmatrix}$

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

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

4. $\begin{bmatrix} 1 \\ -1 \\ 5 \end{bmatrix}, \quad \begin{bmatrix} 1 \\ -4 \\ -1 \end{bmatrix}$

LeastSquares02c
033 10.0 points

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

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

1. $\begin{bmatrix} -1 \\ -6 \end{bmatrix}$

2. $\begin{bmatrix} 21 \\ -22 \end{bmatrix}$

3. $\begin{bmatrix} 24 \\ -9 \end{bmatrix}$

4. $\begin{bmatrix} 3 \\ 3 \end{bmatrix}$

5. $\begin{bmatrix} -15 \\ 24 \end{bmatrix}$

RegressionLine03c
034 10.0 points

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

$$(-1,\,-2), \quad (0,\,-1), \quad (1,\,3), \quad (2,\,-4)\,.$$

OrthogDiag02a
035 10.0 points

When

$$A = \begin{bmatrix} -2 & 8 \\ 8 & -14 \end{bmatrix}$$

find matrices D and P in an orthogonal diagonalization of A given that $\lambda_1 > \lambda_2$.