

This print-out should have 15 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering.

MatrixVecProd03
001 10.0 points

Determine $\mathbf{u}\mathbf{v}^T$ when

$$\mathbf{u} = \begin{bmatrix} -4 \\ -3 \\ 2 \end{bmatrix}, \quad \mathbf{v} = \begin{bmatrix} a \\ b \\ c \end{bmatrix}.$$

1. $\mathbf{u}\mathbf{v}^T = \begin{bmatrix} -4a & -4b & -4c \\ -3a & -3b & -3c \\ 2a & 2b & 2c \end{bmatrix}$

2. $\mathbf{u}\mathbf{v}^T = \begin{bmatrix} -4a & -3a & 2a \\ -4b & -3b & 2b \\ -4c & -3c & 2c \end{bmatrix}$

3. $\mathbf{u}\mathbf{v}^T = -4a - 3b + 2c$

4. $\mathbf{u}\mathbf{v}^T = 2a - 3b - 4c$

True or False?

1. FALSE

2. TRUE

MatrixAlg02aT/F
003 10.0 points

All $n \times n$ invertible matrices A, B have the property

$$(AB)^{-1} = A^{-1}B^{-1}.$$

True or False?

1. FALSE

2. TRUE

M340LInverseTF04
002 10.0 points

Suppose $AB = AC$ for some A, B, C matrices. Suppose that A is invertible. Then, $B = C$.

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

InvertibleTF02a
004 10.0 points

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

True or False?

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

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

1. TRUE

2. FALSE

LUDecomp3x4a
005 10.0 points

Determine the Lower Triangular Matrix L in an LU -decomposition of the matrix

$$A = \begin{bmatrix} -4 & 2 & 0 & 4 \\ 12 & -9 & -2 & -14 \\ -20 & 19 & 6 & 23 \end{bmatrix}.$$

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

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

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

3. *H is a subspace of \mathbb{R}^3 because it can be written as $\text{Span}\{\mathbf{v}_1, \mathbf{v}_2\}$ with $\mathbf{v}_1, \mathbf{v}_2$ in \mathbb{R}^3 .*

4. *H is a subspace of \mathbb{R}^3 because it can be written as $\text{Nul}(A)$ for some matrix A .*

Subspace05a
006 10.0 points

Let H be the set of all vectors

$$\begin{bmatrix} a - 2b \\ ab + 3a \\ b \end{bmatrix}$$

where a and b are real. Determine if H is a subspace of \mathbb{R}^3 , and then check the correct answer below.

1. *H is not a subspace of \mathbb{R}^3 because it is not closed under vector addition.*

2. *H is not a subspace of \mathbb{R}^3 because it does not contain $\mathbf{0}$.*

True or False?

1. TRUE
2. FALSE

DimRankTF02a
007 10.0 points

If \mathcal{B} is a basis for a subspace H , then each vector in H can be written in only one way as a linear combination of the vectors in \mathcal{B} .

True or False?

1. FALSE
2. TRUE

DetInverseT/F01b
009 10.0 points

The matrix

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

is invertible.

True or False?

1. TRUE
2. FALSE

DetElemOps02TF
008 10.0 points

When the matrix

$$B = \begin{bmatrix} a & b \\ c + ka & d + kb \end{bmatrix}$$

is obtained from

$$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

by adding k times row 1 to row 2, then

$$\det[B] = \det[A].$$

VectorSpace01aT/F
010 10.0 points

The subset

$$V = \left\{ \begin{bmatrix} a \\ b \end{bmatrix} : ab \geq 0 \right\}$$

of \mathbb{R}^2 is closed under scalar multiplication.

True or False?

1. TRUE

2. FALSE

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

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

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

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

BasisNull02b
011 10.0 points

Find a basis for the Null space of the matrix

$$A = \begin{bmatrix} 2 & -6 & 4 & -10 \\ 1 & -3 & 5 & -8 \\ 1 & -3 & 3 & -6 \end{bmatrix}.$$

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

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

LinIndSetsTF02e
012 10.0 points

If B is an echelon form of a matrix A , then the pivot columns of B form a basis for $\text{Col } A$.

True or False?

1. TRUE
2. FALSE

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

CoordVec01b
013 10.0 points

Find the coordinate vector $[\mathbf{x}]_{\mathcal{B}}$ in \mathbb{R}^2 for the vector

$$\mathbf{x} = \begin{bmatrix} 4 \\ 0 \end{bmatrix}$$

with respect to the basis

$$\mathcal{B} = \left\{ \begin{bmatrix} 1 \\ -2 \end{bmatrix}, \begin{bmatrix} 5 \\ -6 \end{bmatrix} \right\}$$

for \mathbb{R}^2 .

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

DimSubspace01b
014 10.0 points

Determine the dimension of the subspace

$$\text{Span} \left\{ \begin{bmatrix} 1 \\ 0 \\ 2 \end{bmatrix}, \begin{bmatrix} 3 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 9 \\ 4 \\ -2 \end{bmatrix}, \begin{bmatrix} -7 \\ -3 \\ 1 \end{bmatrix} \right\}$$

of \mathbb{R}^3 .

1. $\dim = 2$
2. $\dim = 5$

3. $\dim = 3$

4. $\dim = 1$

5. $\dim = 4$

RankTF06c
015 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. TRUE

2. FALSE