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

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

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

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

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

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

M340LInverseTF04
002 10.0 points

There are some matrices A, B, C with $AB = AC$, A invertible and $B \neq C$.

True or False?

1. FALSE

2. TRUE

MatrixAlg02aT/F
003 10.0 points

There exist invertible matrices A, B such that

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

True or False?

1. TRUE

2. FALSE

InvertibleTF02a
004 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

LUDecomp3x4a
005 10.0 points

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

$$A = \begin{bmatrix} 4 & 1 & -2 & 4 \\ 16 & 7 & -7 & 21 \\ -4 & 11 & 6 & 21 \end{bmatrix}.$$

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

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

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

4. $L = \begin{bmatrix} 1 & 1 & -2 \\ 0 & 1 & -7 \\ 0 & 0 & 1 \end{bmatrix}$

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

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

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

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

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

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

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. 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

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

True or False?

1. TRUE

2. FALSE

DetInverseT/F01b
009 10.0 points

The matrix

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

is invertible.

True or False?

1. FALSE

2. TRUE

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 vector addition.

True or False?

1. TRUE

2. FALSE

BasisNull02b
011 10.0 points

Find a basis for the Null space of the matrix

$$A = \begin{bmatrix} 2 & -2 & 4 & -6 \\ 3 & -3 & 9 & -18 \\ 2 & -2 & 3 & -3 \end{bmatrix}.$$

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

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

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

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

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

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

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 Col A.

True or False?

1. TRUE

2. FALSE

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

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

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

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

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

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

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 $= 3$

3. dim = 4

4. dim = 5

5. dim = 1

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. FALSE

2. TRUE