Virtual University	**MTH501** **Solved Final Term Paper 3**	**Year** **2017** **For More Plz Visit**
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In the Name of Allāh, the Most Gracious, the Most Merciful

Paper Pattern

MCQS 40 each 1 mark
Short 4 each 2 marks
Short 4 each 3 marks
long 4 each 5 marks

Question No : 12 of 52 Marks: 1 (Budgeted Time 1 Min)

$\|u+v+w\| \le \|u\|+\|v\|+\|w\|$ for all vectors u, v *and* w in an inner product space.

Answer (Please select your correct option)

- True — **correct**
- False

Question No : 13 of 52 Marks: 1 (Budgeted Time 1 Min)

The dominant eigenvalue for the matrix $A = \begin{bmatrix} 0 & 0 & 2 & 0 \\ 1 & 0 & 1 & 0 \\ 0 & 1 & -3 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$ is

Answer (Please select your correct option)

- $\lambda = 1$
- $\lambda = -3$ — **correct**
- $\lambda = -1$
- $\lambda = 0$

Question No : 14 of 52 Marks: 1 (Budgeted Time 1 Min)

A square matrix A is invertible if and only if x = 0 is not an eigen value of A.

Answer (Please select your correct option)

- True — correct
- False

Question No : 15 of 52 Marks: 1 (Budgeted Time 1 Min)

A square matrix with orthogonal columns _____ matrix. (Click on most appropriate)

Answer (Please select your correct option)

- is an orthogonal — correct
- may be an orthogonal
- may not be an orthogonal
- is not an orthogonal

Question No : 16 of 52 Marks: 1 (Budgeted Time 1 Min)

If two rows are orthogonal, they are _____.

Answer (Please select your correct option)

- linearly independent — correct
- linearly dependent

Question No : 17 of 52 Marks: 1 (Budgeted Time 1 Min)

If x is orthogonal to both u and v, then x must be _____ to $u + v$.

not sure

Answer (Please select your correct option)

- orthogonal
- orthonormal

correct

- perpendicular
- parallel

Question No : 18 of 52 Marks: 1 (Budgeted Time 1 Min)

The given system $\begin{matrix} 2x + 3y = 3 \\ 6x + 9y = 7 \end{matrix}$ has

Answer (Please select your correct option)

- Unique solution
- Infinitely many solutions
- No solution

correct

- None of these

Question No : 19 of 52 Marks: 1 (Budgeted Time 1 Min)

Which statement about the matrix $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 7 & 2 & 0 & 0 \\ 9 & 1 & 2 & 0 \\ 5 & 4 & 2 & -1 \end{bmatrix}$ is false?

Answer (Please select your correct option)

- Eigenvalue 2 has Algebraic multiplicity 1
- Eigenvalue of the matrix are 1, 2 and -1.
- Characteristic polynomial of the matrix is $(1-\lambda)(2-\lambda)^2(-1-\lambda)$.
- Eigenvalue -1 has multiplicity 1.

Question No : 20 of 52 Marks: 1 (Budgeted Time 1 Min)

If $A = \begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix}$ is diagonalizable then A has 2 distinct eigenvalues.

Answer (Please select your correct option)

- True
- False

Question No : 21 of 52 Marks: 1 (Budgeted Time 1 Min)

A is diagonalizable if $A = PDP^{-1}$ Where

Answer (Please select your correct option)

- D is any matrix and P is an invertible matrix
- D is a diagonal matrix and P is any matrix
- D is a diagonal matrix and P is invertible matrix

correct

- D is a invertible matrix and P is any matrix

Question No : 22 of 52 Marks: 1 (Budgeted Time 1 Min)

Which statement is FALSE.

Answer (Please select your correct option)

- If $Ax = \lambda x$ for some real number λ then λ is known as eigenvalue of t he matrix A.
- The eigenvalues of any matrix are on its main diagonal.
- In order to find the eigenvalues we solve the equation $|A - \lambda| = 0$
- An eigenspaces of A is the Null space of some matrix

correct

Question No : 23 of 52 Marks: 1 (Budgeted Time 1 Min)

How many terms are there in the algebraic expression $8x^2 + \sqrt{9}x \times 25x^3$?

Answer (Please select your correct option)

- 4
- 3
- 2 **corrcet**
- 1

Question No : 24 of 52 Marks: 1 (Budgeted Time 1 Min)

If two matrices are added, then which of the following should be true for them?

Answer (Please select your correct option)

- Both must have same order. **correct**
- Both must have different order.
- Both must be rectangular.
- Both must be square.

Question No : 25 of 52 Marks: 1 (Budgeted Time 1 Min)

If a matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 2 & 3 \\ 6 & 1 & 1 \end{bmatrix}$, then which of the following is true for A?

Answer (Please select your correct option)

- It is a rectangular matrix.
- It is a row matrix.
- It is a singular matrix. **correct**
- It is a scalar matrix.

Question No : 26 of 52 Marks: 1 (Budgeted Time 1 Min)

If $\vec{v}_1, \vec{v}_2$ and $\vec{v}_3$ are in R^m then which of the following is equivalent to $[v_1 \quad v_2 \quad v_3]\begin{bmatrix} 2 \\ -7 \\ 5 \end{bmatrix}$?

Answer (Please select your correct option)

- $2\vec{v}_1 - 7\vec{v}_2 + 5\vec{v}_3$ **correct**
- $5\vec{v}_1 - 7\vec{v}_2 + 2\vec{v}_3$
- $5\vec{v}_1 + 2\vec{v}_2 - 7\vec{v}_3$
- $2\vec{v}_1 + 5\vec{v}_2 - 7\vec{v}_3$

Question No : 27 of 52 Marks: 1 (Budgeted Time 1 Min)

If $\{\vec{v}_1, \vec{v}_2, \vec{v}_3\}$ is linearly dependent set and $\vec{v}_1 \neq c\,\vec{v}_2$ (where 'c' is a scalar), then which option is true?

Answer (Please select your correct option)

- $\vec{v}_1 \in Span(\vec{v}_1, \vec{v}_2)$
- $\vec{v}_2 \in Span(\vec{v}_1, \vec{v}_2)$
- $\vec{v}_3 \in Span(\vec{v}_1, \vec{v}_2)$
- $\vec{v}_3 \notin Span(\vec{v}_1, \vec{v}_2)$

Question No : 28 of 52 Marks: 1 (Budgeted Time 1 Min)

If $A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 0 & 1 \\ 0 & -1 & 1 \end{bmatrix}$, then which of the following is true for the matrix A ?

Answer (Please select your correct option)

- It is an invertible matrix.
- It is a singular matrix.
- It is a non-invertible matrix. **correct**
- It is a rectangular matrix.

Question No : 29 of 52 Marks: 1 (Budgeted Time 1 Min)

Which of the following is true for the partitioned matrices $A=[C \quad D]$ and $B=[E \quad F]$, where sub-matrices C and D have the same sizes as E and F respectively ?

Answer (Please select your correct option)

- $A+B=[CE \quad DF]$
- $A+B=\begin{bmatrix} C+E \\ D+F \end{bmatrix}$
- $A+B=[C+E \quad D+F]$
- $A+B=\begin{bmatrix} CE \\ DF \end{bmatrix}$

Question No : 30 of 52 Marks: 1 (Budgeted Time 1 Min)

If a matrix A is factorized into lower and upper triangular matrices , then which of the following is true for the matrix ?

Answer (Please select your correct option)

- It is called an LU -procedure.
- It is called an LU -decomposition.
- It is called an LU -matrices.
- It is called an LU -algorithm.

Question No : 31 of 52 Marks: 1 (Budgeted Time 1 Min)

If the matrix $A=\begin{bmatrix} 1 & 5 & 4 \\ 0 & 1 & 7 \\ 0 & 0 & 0 \end{bmatrix}$, then which of the following is true about it ?

Answer (Please select your correct option)

- Its determinant is 0 .
- Its determinant is 2 .
- Its determinant is 4 .
- Its determinant is 6 .

Question No : 32 of 52 Marks: 1 (Budgeted Time 1 Min)

Let a set S is a basis of a vector space V, then which of the following is NOT true about it ?

Answer (Please select your correct option)

- It is linearly dependent.
- Each element of S belongs to V.
- It spans V.
- It is linearly independent.

Question No : 33 of 52 Marks: 1 (Budgeted Time 1 Min)

If $B=\left\{\begin{pmatrix}0\\1\end{pmatrix},\begin{pmatrix}2\\0\end{pmatrix}\right\}$ for R^2 and an $\vec{x}\in R^2$ has coordinate vector $[\vec{x}]_B=\begin{pmatrix}1\\3\end{pmatrix}$, then which of the following is the value of $\vec{x}$?

Answer (Please select your correct option)

- $\vec{x}=\begin{pmatrix}6\\1\end{pmatrix}$
- $\vec{x}=\begin{pmatrix}2\\0\end{pmatrix}$
- $\vec{x}=\begin{pmatrix}0\\1\end{pmatrix}$
- $\vec{x}=\begin{pmatrix}1\\3\end{pmatrix}$

Question No : 34 of 52 Marks: 1 (Budgeted Time 1 Min)

If a set $S=\left(1, x, x^2\right)$ is a basis for p_2 and $[\vec{p}]_S=(2, 4, 7)$, then which of the following is the most appropriate option ?

Answer (Please select your correct option)

- $p_2=2-4x+7x^2$
- $p_2=2-4x-7x^2$
- $p_2=2+4x+7x^2$
- $p_2=4x-7x^2$

Question No : 35 of 52 Marks: 1 (Budgeted Time 1 Min)

Which of the following is the set of standard basis for R^3 ?

Answer (Please select your correct option)

- $\{(1,1,0),(0,1,0),(1,0,1)\}$
- $\{(1,0,0),(0,1,0),(0,0,1)\}$
- $\{(1,0,0),(1,1,0),(0,0,1)\}$
- $\{(1,0,0),(0,1,0),(1,1,1)\}$

Question No : 36 of 52 Marks: 1 (Budgeted Time 1 Min)

Consider the bases for R^2 given by $B=\{\vec{b}_1, \vec{b}_2\}$ and $C=\{\vec{c}_1, \vec{c}_2\}$; where $\vec{b}_1=\begin{bmatrix}1\\0\end{bmatrix}$, $\vec{b}_2=\begin{bmatrix}-1\\1\end{bmatrix}$, $\vec{c}_1=\begin{bmatrix}-5\\3\end{bmatrix}$, $\vec{c}_2=\begin{bmatrix}-2\\1\end{bmatrix}$, also assume that $P_{B\leftarrow C}=\begin{bmatrix}-2 & -1\\3 & 1\end{bmatrix}$; then which of the following is the change-of-coordinates matrix from B to C ?

Answer (Please select your correct option)

- $P_{C\leftarrow B}=\begin{bmatrix}1 & 1\\-3 & -2\end{bmatrix}$
- $P_{C\leftarrow B}=\begin{bmatrix}1 & -1\\0 & 1\end{bmatrix}$
- $P_{C\leftarrow B}=\begin{bmatrix}-5 & -2\\3 & 1\end{bmatrix}$
- $P_{C\leftarrow B}=\begin{bmatrix}-8 & -3\\3 & 1\end{bmatrix}$

Question No : 37 of 52 Marks: 1 (Budgeted Time 1 Min)

If the general term of a typical signal is $(0.6)^k$, then determine which of the following is the signal for $k=-2$?

Answer (Please select your correct option)

- $(0.6)^{-2}=0$
- $(0.6)^{-2}=0.6$
- $(0.6)^{-2}=(0.6)^2$
- $(0.6)^{-2}=1/(0.6)^2$

Question No : 38 of 52 Marks: 1 (Budgeted Time 1 Min)

If the Casorati matrix is not invertible , then which of the following is the most appropriate option regarding the associated signals ?

Answer (Please select your correct option)

- The signals are linearly independent .
- The signals are linearly dependent .
- The signals may or may not dependent .
- The signals may or may not independent .

Question No : 39 of 52 Marks: 1 (Budgeted Time 1 Min)

If $\{y_k\} = \{\ldots, 1, 0.7, 0, -0.7, -1, -0.7, 0, 0.7, 1, 0.7, 0, \ldots\}$ and $0.35y_{k+2} + 0.6y_{k+1} + 0.42y_k = z_k$;

$\uparrow$

$k = 0$

then which of the following is the value of z_0 ?

Answer (Please select your correct option)

- 0.840
- 0.049
- −0.770
- − 1.139

Question No : 39 of 52 Marks: 1 (Budgeted Time 1 Min)

If $\{y_k\} = \{\ldots, 1, 0.7, 0, -0.7, -1, -0.7, 0, 0.7, 1, 0.7, 0, \ldots\}$ and $0.35y_{k+2} + 0.6y_{k+1} + 0.42y_k = z_k$;

$\uparrow$

$k = 0$

then which of the following is the value of z_0 ?

Answer (Please select your correct option)

- 0.840
- 0.049
- −0.770
- − 1.139

Question No : 40 of 52 — **Marks: 1 (Budgeted Time 1 Min)**

Suppose that $B=\{b_1, b_2\}$ is a basis for V and $C=\{c_1, c_2, c_3\}$ is a basis for W. Let $T: V \to W$ be a linear transformation with the property that $T(b_1)=5c_1-2c_2+3c_3$ and $T(b_2)=4c_1-c_2+7c_3$. Determine the value of $[T(b_2)]_C$?

Answer (Please select your correct option)

- $\begin{bmatrix} 5 \\ -2 \\ \end{bmatrix}$
- $\begin{bmatrix} 7 \\ -1 \\ \end{bmatrix}$
- $\begin{bmatrix} 4 \\ -1 \\ \end{bmatrix}$
- $\begin{bmatrix} 3 \\ -2 \\ \end{bmatrix}$

Question No : 41 of 52 — **Marks: 2 (Budgeted Time 4 Min)**

Determine whether the set of vectors are orthogonal or not.

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

Answer (Please click here to Add Answer)

Question No : 41 of 52 — **Marks: 2 (Budgeted Time 4 Min)**

$\begin{bmatrix} 5 \\ -4 \\ 0 \\ 3 \end{bmatrix}, \begin{bmatrix} -4 \\ 1 \\ -3 \\ 8 \end{bmatrix}, \begin{bmatrix} 3 \\ 3 \\ 5 \\ 1 \end{bmatrix}$

Answer (Please click here to Add Answer)

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Question No : 42 of 52 Marks: 2 (Budgeted Time 4 Min)

Is the following set of vectors is orthogonal with respect to the Euclidean inner product on $\mathbb{R}^3$?

$$\left(\frac{1}{\sqrt{6}},\frac{1}{\sqrt{6}},-\frac{2}{\sqrt{6}}\right),\left(\frac{1}{\sqrt{2}},-\frac{1}{\sqrt{2}},0\right)$$

Answer (Please click here to Add Answer)

Question No : 43 of 52 Marks: 2 (Budgeted Time 4 Min)

If a matrix $A=\begin{bmatrix}1 & 4 & 5\\ 4 & 5 & 6\\ 7 & 8 & 8\end{bmatrix}$ and $\det(A^t)=6$, then find the determinant of the matrix.

Answer (Please click here to Add Answer)

Question No : 44 of 52 Marks: 2 (Budgeted Time 4 Min)

Let $B=\{b_1, b_2, b_3\}$ and D $=\{d_1, d_2\}$ be bases for vector spaces V and W, respectively. Let $T: V \to W$ be a linear transformation with the property that $T(b_1)=3d_1-5d_2$, $T(b_2)=-d_1+6d_2$ and $T(b_3)=4d_2$. Find a matrix M for T relative to B and D.

Answer (Please click here to Add Answer)

Question No : 45 of 52 Marks: 3 (Budgeted Time 6 Min)

Determine whether the vectors $y = \begin{bmatrix} -3 \\ 7 \\ 4 \\ 0 \end{bmatrix}, z = \begin{bmatrix} 1 \\ -8 \\ 15 \\ -7 \end{bmatrix}$ are orthogonal.

Answer (Please click here to Add Answer)

Question No : 46 of 52 Marks: 3 (Budgeted Time 6 Min)

Let W = Span $\{x_1, x_2\}$, where $x_1 = \begin{bmatrix} 3 \\ 0 \\ -1 \end{bmatrix}, x_2 = \begin{bmatrix} 8 \\ 5 \\ -6 \end{bmatrix}$. Construct an orthogonal basis $\{v_1, v_2\}$ for W.

Answer (Please click here to Add Answer)

Question No : 47 of 52 Marks: 3 (Budgeted Time 6 Min)

If $A = \begin{pmatrix} 1 & 2 \\ 2 & 1 \end{pmatrix}$ then find an invertible matrix P such that $P^{-1}AP = D(diagonal\ matrix)$

Answer (Please click here to Add Answer)

Question No : 48 of 52 Marks: 3 (Budgeted Time 6 Min)

Let $\vec{v}_1 = \begin{bmatrix} 1 \\ 0 \\ -2 \end{bmatrix}$, $\vec{v}_2 = \begin{bmatrix} -2 \\ 1 \\ 7 \end{bmatrix}$ and $\vec{y} = \begin{bmatrix} h \\ -3 \\ -5 \end{bmatrix}$. For what value(s) of '$h$' is $\vec{y}$ in the plane generated by $\vec{v}_1$ and $\vec{v}_2$?

Answer (Please click here to Add Answer)

Question No : 49 of 52 Marks: 5 (Budgeted Time 10 Min)

Compute the least square error associated with the least square solution $\hat{x} = \begin{bmatrix} \frac{4}{3} \\ \frac{-1}{3} \end{bmatrix}$ of the equation $Ax = b$ where $A = \begin{bmatrix} 1 & -2 \\ -1 & 2 \\ 0 & 3 \\ 2 & 5 \end{bmatrix}, b = \begin{bmatrix} 3 \\ 1 \\ -4 \\ 2 \end{bmatrix}$

Answer (Please click here to Add Answer)

Question No : 50 of 52 Marks: 5 (Budgeted Time 10 Min)

Find the dominant Eigen pair (i.e. the Eigen value and Eigen vector) by using the Power Method for the following matrix. (Perform only 1 iteration)

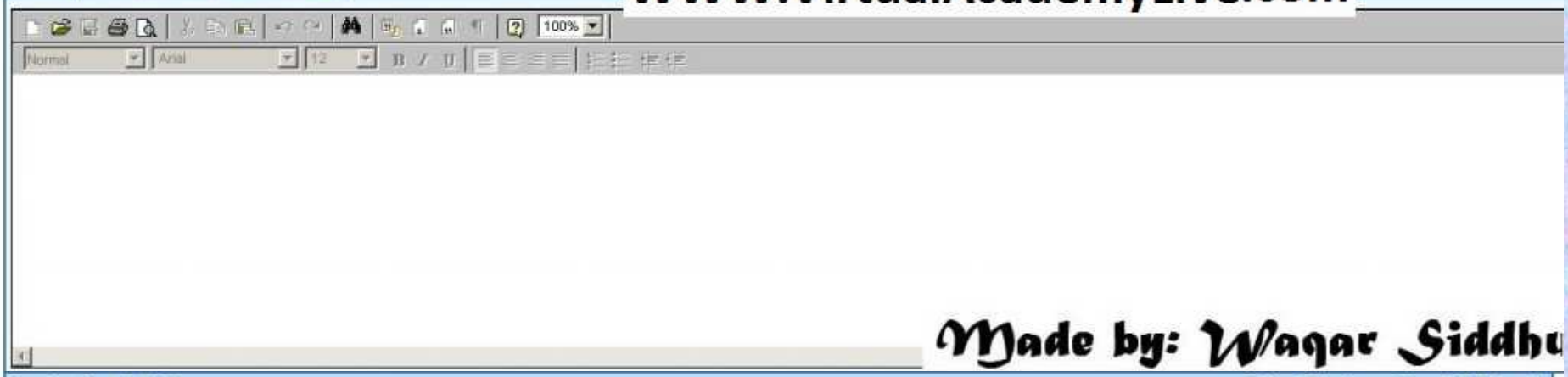
$A = \begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$, $x_0 = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$

Answer (Please click here to Add Answer)

Question No : 51 of 52 Marks: 5 (Budgeted Time 10 Min)

Find A^2, given that $A = PDP^{-1}$, where P and D are given below $A = \begin{pmatrix} 2 & 6 \\ -4 & 12 \end{pmatrix}, P = \begin{pmatrix} 3 & 1 \\ 2 & 1 \end{pmatrix}, D = \begin{pmatrix} 6 & 0 \\ 0 & 8 \end{pmatrix}, P^{-1} = \begin{pmatrix} 1 & -1 \\ -2 & 3 \end{pmatrix}$

Answer (Please click here to Add Answer)



Question No : 52 of 52 Marks: 5 (Budgeted Time 10 Min)

Let $A = \begin{bmatrix} 1 & 4 \\ 5 & 6 \end{bmatrix}$ and $\vec{c} = \begin{bmatrix} 2 \\ 3 \end{bmatrix}$. Define $T : R^2 \to R^2$ by $T(\vec{x}) = A\vec{x}$. Determine if $\vec{c}$ is in the range of the transformation T.

Answer (Please click here to Add Answer)

Question No : 1 of 52 Marks: 1 (Budgeted Time 1 Min)

Which statement about the General Least Square Method is true?

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Answer (Please select your correct option)

- Solution obtained by this method is always unique.
- This is a numerical method for the solution of System of Linear Equations.
- This method find an x that makes Ax as close as possible to the b.

correct

- This method gives us exact solution of the system.

Question No : 2 of 52 Marks: 1 (Budgeted Time 1 Min)

Let $v = (1, -2, 2, 0)$ .The unit vector in the same direction as v is

Answer (Please select your correct option)

- $\left(\frac{1}{3}, \frac{2}{3}, \frac{2}{3}, 0\right)$
- $\left(\frac{1}{3}, \frac{-2}{3}, \frac{2}{3}, 0\right)$
- $\left(\frac{-1}{3}, \frac{2}{3}, \frac{-2}{3}, 0\right)$
- $\left(\frac{1}{3}, \frac{-2}{3}, \frac{2}{3}, \frac{1}{3}\right)$

Question No : 3 of 52 Marks: 1 (Budgeted Time 1 Min)

Let $u = (3, -2), v = (4, 5)$ .For the weighted Euclidean inner product $\langle u, v \rangle = 4u_1v_1 + 5u_2v_2$

$\langle v, u \rangle =$

Answer (Please select your correct option)

- 2
- -2
- 3
- -3

Question No : 4 of 52 Marks: 1 (Budgeted Time 1 Min)

Let $v = (0, 2, 2, 1)$ .The unit vector in the same direction as v is

Answer (Please select your correct option)

- $\left(0, \frac{2}{3}, \frac{2}{3}, \frac{-1}{3}\right)$
- $\left(0, \frac{-2}{3}, \frac{2}{3}, \frac{-1}{3}\right)$
- $\left(0, \frac{2}{3}, \frac{2}{3}, \frac{1}{3}\right)$
- $\left(0, \frac{-2}{3}, \frac{2}{3}, \frac{1}{3}\right)$

Question No : 5 of 52 Marks: 1 (Budgeted Time 1 Min)

Let $\mathbb{R}^3$ have the Euclidean inner product. Then $u=(2,1,3), v=(1,7,k)$ are orthogonal for

Answer (Please select your correct option)

- $k=9$
- $k=-3$
- $k=-9$
- $k=3$

Question No : 6 of 52 Marks: 1 (Budgeted Time 1 Min)

Let A be $n\times n$ matrix whose entries are real. If λ is an eigenvalue of A with x a corresponding eigenvector in $\mathbb{C}^n$, then

Answer (Please select your correct option)

- $A\bar{x}=\lambda\bar{x}$
- $A\bar{x}=\overline{\lambda x}$
- $A\bar{x}=\bar{\lambda}x$
- $A\bar{x}=\lambda^{-1}\bar{x}$

Question No : 7 of 52 Marks: 1 (Budgeted Time 1 Min)

Suppose that $A=\begin{bmatrix}1.25 & -.75\\ -.75 & 1.25\end{bmatrix}$ has eigenvalues 2 and 0.5 .Then origin is a

origin 'O' is called the saddle point because one eigenvalue is greater tha in magnitude and one is less than '1' in magnitude.

Answer (Please select your correct option)

- Saddle point

correct

- Repellor
- Attractor

Question No : 8 of 52 Marks: 1 (Budgeted Time 1 Min)

Suppose that $A = \begin{bmatrix} 0.5 & 0.6 \\ -0.3 & 1.4 \end{bmatrix}$ has eigenvalues 0.8 and 1.1 .Then origin is a

Answer (Please select your correct option)

- Saddle point

correct

- Repellor
- Attractor

Question No : 9 of 52 Marks: 1 (Budgeted Time 1 Min)

If A is an $m \times n$ matrix with linearly independent column vectors, then A can be factored as

$$A = QR$$

Where Q is an $m \times n$ matrix with orthonormal column vectors, and R is an $n \times n$

Answer (Please select your correct option)

- Upper triangular matrix
- Invertible matrix
- Invertible lower triangular matrix
- Invertible upper triangular matrix

Question No : 10 of 52 Marks: 1 (Budgeted Time 1 Min)

The matrix equation $A^T A\hat{x} = A^T b$ represents a system of linear equations commonly referred to as the

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Answer (Please select your correct option)

- normal equations for x
- normal equations for $\hat{x}$

correct

- normal equations for A
- normal equations for b

Question No : 11 of 52 Marks: 1 (Budgeted Time 1 Min)

By the Best Approximation Theorem, the distance from y to W is $\|y - \hat{y}\|$, where $\hat{y} =$

Answer (Please select your correct option)

- $\text{proj}_W \hat{y}$
- $\text{proj}_W y$ correct
- $\text{proj}_y W$