Exam : Quiz 2
Subject : Maths2
Total Marks : 50.00
QP : 2025 Mar16: IIT M AN EXAM QIM4

Exam Mode | Learning Mode

View Question Paper Summary

QUESTION MENU

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10 11 12 13 14 15 16 17 18
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TIMER

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CONTROLS

SUBMIT EXAM

Your Score
0.00 / 50.00
(0%)

Question 1 : 6406531175673 Total Mark : 0.00 | Type : MCQ

THIS IS QUESTION PAPER FOR THE SUBJECT **"FOUNDATION LEVEL : SEMESTER II: MATHEMATICS FOR DATA SCIENCE II (COMPUTER BASED EXAM)" ARE YOU SURE YOU HAVE TO WRITE EXAM FOR THIS SUBJECT? CROSS CHECK YOUR HALL TICKET TO CONFIRM THE SUBJECTS TO BE WRITTEN. (IF IT IS NOT THE**

CORRECT SUBJECT, PLS CHECK THE SECTION AT THE TOP FOR THE SUBJECTS REGISTERED BY YOU)

OPTIONS :

- YES
- NO

Your score : 0

Discussions (0)

Question 2 : 6406531175674

View Solutions (0)

Total Mark : 2.00 | Type : MCQ

Let $A = \begin{bmatrix} \frac{2}{7} & \frac{6}{7} & \frac{3}{7} \\ \frac{3}{7} & \frac{2}{7} & -\frac{6}{7} \\ \frac{6}{7} & -\frac{3}{7} & \frac{2}{7} \end{bmatrix}$. Choose the correct option for A^{-1}.

OPTIONS :

- $A^{-1} = \begin{bmatrix} \frac{2}{7} & \frac{6}{7} & \frac{3}{7} \\ \frac{3}{7} & \frac{2}{7} & -\frac{6}{7} \\ \frac{6}{7} & -\frac{3}{7} & \frac{2}{7} \end{bmatrix}$
- $A^{-1} = \begin{bmatrix} \frac{4}{7} & \frac{3}{7} & \frac{2}{7} \\ \frac{2}{7} & \frac{4}{7} & -\frac{3}{7} \\ \frac{3}{7} & -\frac{2}{7} & \frac{4}{7} \end{bmatrix}$
- $A^{-1} = \begin{bmatrix} \frac{2}{7} & \frac{3}{7} & \frac{6}{7} \\ \frac{6}{7} & \frac{2}{7} & -\frac{3}{7} \\ \frac{3}{7} & -\frac{6}{7} & \frac{2}{7} \end{bmatrix}$

○ $A^{-1} = \begin{bmatrix} 2 & 3 & 6 \\ 6 & 2 & -3 \\ 3 & -6 & 2 \end{bmatrix}$

Your score : 0

Discussions (0)

Question 3 : 6406531175675

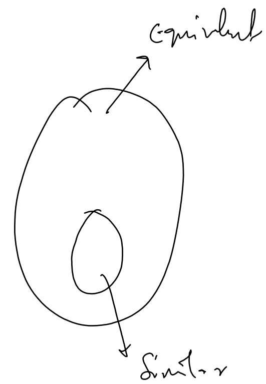
View Solutions (0)

Total Mark : 4.00 | Type : MSQ

Suppose $T\colon \mathbb{R}^3 \to \mathbb{R}^3$ is a linear transformation. Let M_1 and M_2 denote the matrix representations of T with respect to distinct bases (for both domain and codomain) β_1 and β_2, respectively. Choose the correct statements from the following.

OPTIONS :

M_1 equivalent M_2
3×3



- [ ] $\text{rank}(M_1) = \text{rank}(M_2)$
- [ ] $\text{Columnspace}(M_1) = \text{Columnspace}(M_2)$
- [ ] $\text{Nullspace}(M_1) = \text{Nullspace}(M_2)$
- [ ] $\text{trace}(M_1) = \text{trace}(M_2)$
- [ ] $\det(M_1) = \det(M_2)$

M_1 Similar M_2

Your score : 0

Discussions (1)

Question 4 : 6406531175676

View Solutions (0)

Total Mark : 4.00 | Type : MSQ

Let $A = \begin{bmatrix} -2 & 0 & 3 \\ 4 & -1 & 2 \end{bmatrix}$. Which of the matrices below are equivalent to A?

rank = 2

OPTIONS :

- [ ] $\begin{bmatrix} 1 & 2 & 3 \\ 3 & 2 & 1 \end{bmatrix}$ ✓

- [ ] $\begin{bmatrix} -2 & 0 & 3 \\ -4 & 0 & 6 \end{bmatrix}$ ✗ $\longrightarrow$ rank = 1 $R_2 = 2R_1$

- [ ] $\begin{bmatrix} 1 & 4 & 3 \\ -1 & 4 & 3 \end{bmatrix}$ ✓

- [ ] $\begin{bmatrix} -4 & 1 & -2 \\ 2 & 0 & -3 \end{bmatrix}$ ✓

If $\begin{bmatrix} 1 & 4 & 3 \\ 1 & 4 & 3 \end{bmatrix}$ rank = 1 $R_2 = 1 \times R_1$

$\begin{bmatrix} 1 & 4 & 3 \\ -1 & 4 & 3 \end{bmatrix} \downarrow R_2 = R_2 + R_1$ $\begin{bmatrix} 1 & 4 & 3 \\ 0 & 8 & 6 \end{bmatrix}$ rank = 2 $\downarrow$ $\begin{bmatrix} 1 & 4 & 3 \\ 0 & 1 & 6/8 \end{bmatrix}$

Your score : 0

Discussions (0)

Question 5 : 6406531175677

View Solutions (0) Total Mark : 4.00 | Type : MSQ

Let $A = \begin{bmatrix} 2 & -3 \\ 4 & 1 \end{bmatrix}$. Choose all the correct option(s). $\rightarrow$ rank = 2

$\left\{ \begin{array}{l} \text{If Similar} \longrightarrow \text{Rank, trace, det are equal} \\ \text{Converse is false.} \end{array} \right\}$

OPTIONS :

- [ ] If A is ~~equivalent~~ similar ✓ to a matrix B, then they have the same rank, trace, and determinant.

- [ ] $B \in M_{2\times 2}(\mathbb{R})$ is a matrix with the same rank, trace, and determinant as A. Then A and B are similar. converse is false

- [ ] $B \in M_{2\times 2}(\mathbb{R})$ is a matrix such that $A = \begin{bmatrix} 0 & -1 \\ 5 & 0 \end{bmatrix} B$. Then A and B are equivalent. invertible inverse exist

- [ ] A is equivalent to any 2×2 orthogonal matrix. ✓

$A^T A = A A^T = I$

$\begin{bmatrix} 0 & -1 \\ 5 & 0 \end{bmatrix}^{-1} A I = B$

P, Q are invertible $P \; A \; Q = B$

Your score : 0

$A = \begin{bmatrix} | & | \\ c_1 & c_2 \\ | & | \end{bmatrix}$

$c_1^T c_2 = 0$

$c_1^T c_1 = 1$

$c_2^T c_2 = 1$

rank = 2

$\begin{bmatrix} - c_1 - \\ - c_2 - \end{bmatrix} \begin{bmatrix} | & | \\ c_1 & c_2 \\ | & | \end{bmatrix} = \begin{bmatrix} c_1^T c_1 & c_2^T c_1 \\ c_2^T c_1 & c_1^T c_2 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

Discussions (0)

Scalar matrix

$\begin{bmatrix} k_1 & 0 \\ 0 & k_2 \end{bmatrix}$

Question 6 : 6406531175678

View Solutions (0)

Total Mark : 2.00 | Type : SA

Find the maximum possible nullity of a 3 × 4 matrix.

rank + nullity = 4

min rank =

Answer (Numeric):

Answer

Accepted Answer : 4

Your score : 0

Discussions (0)

Question 7 : 6406531175679

View Solutions (0)

Total Mark : 2.00 | Type : SA

Let $A = \begin{bmatrix} -1 & 1 \\ 1 & 5 \end{bmatrix}$ and $B = (b_{ij})$ is a matrix similar to A. If $b_{11} = 7$, find b_{22}.

$-1 + 5 = 7 + b_{22}$

Answer (Numeric):

Answer

$b_{22} = 4 - 7 = -3$

Accepted Answer : -3

Your score : 0

Discussions (0)

Question 8 : 6406531175680

Total Mark : 0.00 | Type : COMPREHENSION

Based on the above data, answer the given subquestions.

Consider the matrix

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

$\downarrow \ \downarrow$

$\begin{pmatrix} 1 & 0 & 1 & -2 \\ 0 & 1 & 1 & 2 \\ 0 & 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix}$

$x_1 = -x_3 + 2x_4$

$x_2 = -x_3 - 2x_4$

$(-x_3 + 2x_4, -x_3 - 2x_4, x_3, x_4)$

$(-4, 0, 2, -1)$

$\alpha \quad \beta$

Your score : 0

Question 9 : 6406531175681

View Parent QN | View Solutions (0)

Total Mark : 2.00 | Type : SA

If $(\alpha, \beta, 2, -1)$ is a vector in the nullspace of A, then find the value of $\alpha - \beta$.

Answer (Numeric):

Answer

Accepted Answer : -4

Your score : 0

Discussions (0)

Question 10 : 6406531175682

View Parent QN | View Solutions (0)

Total Mark : 2.00 | Type : SA

Find the nullity of the matrix A.

Answer (Numeric):

Answer

Accepted Answer : 2

Your score : 0

Discussions (0)

Question 11 : 6406531175683

Total Mark : 0.00 | Type : COMPREHENSION

Based on the above data, answer the given subquestions.

Let $T: \mathbb{R}^3 \to \mathbb{R}^3$ be the linear transformation determined by $T(1,0,0) = (1,0,4)$, $T(1,1,0) = (-2,3,1)$, and $T(0,0,1) = (1,-1,1)$.

$T(x,y,z) = (x-y)T(1,0,0) + yT(1,1,0) + zT(0,0,1)$

$= (x-y)(1,0,4) + y(-2,3,1) + z(1,-1,1)$

$= (x-y-2y+z,\ 3y-z,\ 4x-4y+y+z)$

$= (x-3y+z,\ 3y-z,\ 4x-3y+z)$

Your score : 0

Question 12 : 6406531175684

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

View Parent QN View Solutions (0)

Total Mark : 2.00 | Type : MCQ

Choose the correct definition for the linear transformation T.

OPTIONS :

- $T(x,y,z) = (x-2y+z, 3y+z, 4x-3y-z)$
- $T(x,y,z) = (x-3y+z, 3y+z, 4x-3y+z)$
- $T(x,y,z) = (x-2y+z, 3y-z, 4x+y+z)$
- $T(x,y,z) = (x-3y+z, 3y-z, 4x-3y+z)$

Your score : 0

Discussions (0)

Question 13 : 6406531175685

View Parent QN View Solutions (0)

Total Mark : 4.00 | Type : MCQ

Which of the following statements is true?

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & -1/3 \\ 0 & 0 & 0 \end{bmatrix}$$

rank $= 2 \neq 3$ so not onto

nullity $= 1 \neq 0$ so not into

OPTIONS :

- T is neither one-to-one nor onto.
- T is one-to-one, but not onto.

- ◯ T is onto, but not one-to-one.
- ◯ T is a linear isomorphism.

Your score : 0

Discussions (0)

Question 14 : 6406531175686

Total Mark : 0.00 | Type : COMPREHENSION

Based on the above data, answer the given subquestions.

Consider the linear transformation $T : \mathbb{R}^3 \to \mathbb{R}^2$ defined by $T(x, y, z) = (x - 3y - (k + 1)z, 2x + ky + 10z)$ for all $(x, y, z) \in \mathbb{R}^3$, where $k \in \mathbb{R}$.

we want nullity = 2

rank = 1

$$\begin{bmatrix} 1 & -3 & -k-1 \\ 2 & k & 10 \end{bmatrix}$$

-6

$R_2 = R_2 - 2R_1$

$$\begin{bmatrix} 1 & -3 & -k-1 \\ 0 & k+6 & 10+2k+2 \end{bmatrix}$$

$k+6 = 0$, $k = -6$

$10+2k+2 = 0$, $k = -6$

Your score : 0

Question 15 : 6406531175687

View Parent QN | View Solutions (0)

Total Mark : 2.00 | Type : SA

Find the value of k for which the nullity of the transformation T equals 2.

$$\begin{bmatrix} 1 & -3 & +5 \\ 2 & -6 & 10 \end{bmatrix}$$

Answer (Numeric):

Answer

Accepted Answer : -6

Your score : 0

Discussions (0)

Question 16 : 6406531175688

View Parent QN | View Solutions (0)

Total Mark : 4.00 | Type : MSQ

For the value of k obtained in previous question which of the following vectors belong to the range of T?

$$T\begin{pmatrix}x_1\\x_2\\x_3\end{pmatrix} = \begin{pmatrix}1 & -3 & 5\\2 & -6 & 10\end{pmatrix}\begin{pmatrix}x_1\\x_2\\x_3\end{pmatrix}$$

$$\boxed{x_1\begin{pmatrix}1\\2\end{pmatrix} + x_2\begin{pmatrix}-3\\-6\end{pmatrix} + x_3\begin{pmatrix}5\\10\end{pmatrix}}$$

OPTIONS :

- [ ] (1, 2) $x_1=1,\ x_2=0,\ x_3=0$
- [ ] (−1,−2) $x_1=-1,\ x_2=0,\ x_3=0$ / x_1, x_2, x_3: $0, \tfrac{1}{2}, 0$
- [ ] (1,−2) x
- [ ] (−1, 2) x

$$\left[\begin{array}{ccc|c}1 & -3 & 5 & 1\\2 & -6 & 10 & 2\end{array}\right] \quad \left[\begin{array}{ccc|c}1 & -3 & 5 & 1\\0 & 0 & 0 & 0\end{array}\right]$$

$x_1 - 3x_2 + 5x_3 = 1$

$$\left[\begin{array}{ccc|c}1 & -3 & 5 & 1\\2 & -6 & 10 & -2\end{array}\right] \quad \left[\begin{array}{ccc|c}1 & -3 & 5 & 1\\0 & 0 & 0 & -4\end{array}\right]$$ Absurd

Your score : 0

Discussions (0)

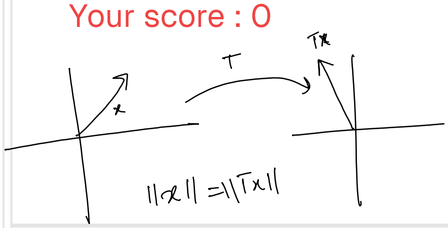
Question 17 : 6406531175689

Total Mark : 0.00 | Type : COMPREHENSION

Based on the above data, answer the given subquestions.

Let T be an orthogonal transformation defined on $\mathbb{R}^3$ with the usual inner product.

Your score : 0



$\|x\| = \|Tx\|$

$[T] = A \qquad A^TA = I = AA^T$

$\|Tx\|^2 = \langle Tx, Tx\rangle = (Tx)^T Tx = (Ax)^T Ax \to x^TA^TAx \quad x^Tx = \|x\|^2$

Question 18 : 6406531175690

View Parent QN | View Solutions (0)

Total Mark : 2.00 | Type : SA

Find $\|T(4, 0, -3)\|$. $= \|4,0,-3\| = 5$

Answer (Numeric):

Answer

Accepted Answer : 5

Your score : 0

Discussions (0)

Question 19 : 6406531175691

View Parent QN | View Solutions (0)

Total Mark : 2.00 | Type : SA

Suppose Q is the matrix representation of T with respect to some ordered basis, then find $det(Q^2)$.

T is orthogonal

$[T] = Q$

$Q^{-1} = Q^T \leftarrow Q^TQ = QQ^T = I$

If $A^T = A \rightarrow$ Symmetric matrices

$Q^2 = I$

$det(Q^2) = 1$

Answer (Numeric):

Answer

Accepted Answer : 1

Your score : 0

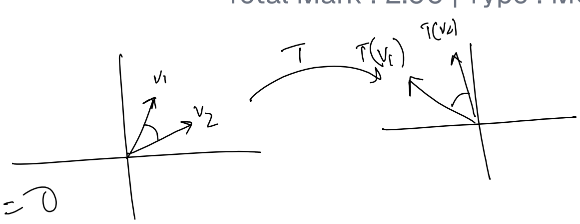
Discussions (0)

Question 20 : 6406531175692

View Parent QN | View Solutions (0)

Total Mark : 2.00 | Type : MCQ

Find the angle between T(1, 1, 1) and T(1,−2, 1).



OPTIONS :

- $\frac{\pi}{3}$

$\cos\theta = \frac{\langle\ ,\ \rangle}{\|\ \|\ \|\ \|} = \frac{0}{\sim} = 0$

$\theta = \pi/2$

○ $\frac{3\pi}{2}$

○ π

○ $\frac{\pi}{2}$

Your score : 0

Discussions (0)

Question 21 : 6406531175693

Total Mark : 0.00 | Type : COMPREHENSION

Let $u_1 = (1, 0, 1), u_2 = (1, 1, 1)$ and $W = span\{u_1, u_2\}$.
Answer the given subquestions.

$P_{u_1}(u_2) = \frac{\langle u_2, u_1 \rangle}{\langle u_1, u_1 \rangle} u_1 = \frac{2}{\sqrt{2}\sqrt{2}}(1,0,1)$

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

Your score : 0

Question 22 : 6406531175694

View Parent QN

View Solutions (0)

Total Mark : 2.00 | Type : SA

If (a, b, c) is the projection of u_2 on u_1, find $a + b + c$.

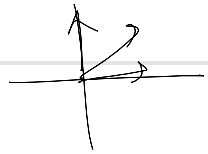
Answer (Numeric):

Answer

Accepted Answer : 2

Your score : 0

Discussions (0)



Question 23 : 6406531175695

View Parent QN | View Solutions (0)

Total Mark : 2.00 | Type : MCQ

u_2 (1,1,1)

(0,1,0)

(1,0,1) u_1

$\frac{1}{\sqrt{2}}(1,0,1)$

$Proj_{u_1} u_2 = (1,0,1)$

$(1,1,1) - (1,0,1) = (0,1,0)$

Let $\{v_1, v_2\}$ be the orthonormal set of vectors obtained from $\{u_1, u_2\}$ by applying Gram-Schmidt process. Choose the correct option.

OPTIONS :

- $v_1 = \frac{1}{\sqrt{2}}(1,0,1), v_2 = \frac{1}{\sqrt{3}}(-1,1,1)$
- $v_1 = \frac{1}{\sqrt{2}}(1,0,1), v_2 = (0,1,0)$
- $v_1 = \frac{1}{\sqrt{2}}(1,0,1), v_2 = \frac{1}{\sqrt{2}}(-1,0,1)$
- $v_1 = \frac{1}{\sqrt{2}}(1,0,1), v_2 = \frac{1}{\sqrt{2}}(1,0,-1)$

Your score : 0

Discussions (0)

Question 24 : 6406531175696

View Parent QN | View Solutions (0)

Total Mark : 2.00 | Type : MCQ

$u_1 = 1,0,1$

$u_2 = 1,1,1$

$W = \alpha(1,0,1) + \beta(1,1,1)$

$= (\alpha+\beta, \beta, \alpha+\beta)$

$x \quad y \quad z$

$x \quad y \quad x$

$W = \{(x,y,z) \mid x = z\}$

Choose the correct option for W.

OPTIONS :

- $W = \{(x,y,z) \mid x + y = z\}$
- $W = \{(x,y,z) \mid x - y = z\}$

- ○ $W = \{(x, y, z) \mid x = y = z\}$
- ○ $W = \{(x, y, z) \mid x = z\}$

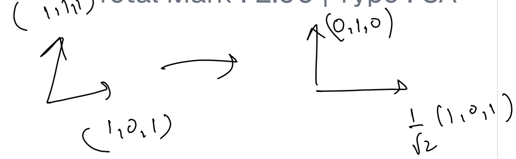
Your score : 0

Discussions (0)

Question 25 : 6406531175697

View Parent QN | View Solutions (0)

Total Mark : 2.00 | Type : SA



Let (a, b, c) be the vector obtained by projecting the vector $(1, 2, 3)$ on W. Find $a + b + c$.

$\text{Proj}_W (1,2,3) = \text{Proj}_{(0,1,0)} (1,2,3) + \text{Proj}_{\frac{1}{\sqrt{2}}(1,0,1)} (1,2,3)$

$= \frac{\langle (1,2,3),(0,1,0)\rangle}{\langle (0,1,0),(0,1,0)\rangle}(0,1,0) + \frac{\langle (1,2,3),\frac{(1,0,1)}{\sqrt{2}}\rangle}{(1)}\left(\frac{1}{\sqrt{2}},0,\frac{1}{\sqrt{2}}\right)$

Answer (Numeric):

Answer

$2(0,1,0) + \frac{4}{\sqrt{2}}\left(1/\sqrt{2}, 0, 1/\sqrt{2}\right)$

$(0,2,0) + (2,0,2)$

$(2,2,2)$

Accepted Answer : 6

Your score : 0

Discussions (0)

Question 26 : 6406531175698

View Parent QN | View Solutions (0)

Total Mark : 2.00 | Type : MCQ

Which of the affine spaces below correspond to the subspace W ?

$W = (x,y,x)$

$(0,0,2)$

OPTIONS :

- ○ $L = \{(x, x + 1, x + 2) \mid x \in \mathbb{R}\}$
- ○ $L = \{(x, y, z) \mid x + z = 1, y \in \mathbb{R}\}$
- ✓ $L = \{(x, y, x + 2) \mid \mid x, y \in \mathbb{R}\}$

○ $L = \{(x, y, z) \mid x + y + z = 3\}$

Your score : 0

Discussions (0)

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