Exam :	Quiz 2
Subject :	Maths2
Total Marks :	50.00
QP :	2025 Aug3: IIT M AN EXAM QIP4

Exam Mode Learning Mode

View Question Paper Summary

QUESTION MENU

1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18

TIMER

00:38

CONTROLS

SUBMIT EXAM

Your Score

0.00 / 50.00

(0%)

Question 1 : 6406531333375

Total Mark : 0.00 | Type : MCQ

THIS IS QUESTION PAPER FOR THE SUBJECT **"FOUNDATION LEVEL : 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 : 6406531333376

View Solutions (0) Total Mark : 2.00 | Type : MCQ

Let A be a 3×5 matrix whose row echelon form is given by

$$\begin{pmatrix} 1 & 2 & -1 & 2 & 1 \\ 0 & 0 & 1 & 3 & -2 \\ 0 & 0 & 0 & k & 0 \end{pmatrix},$$

where $k \in \mathbb{R}$. Choose the correct options from the following.

OPTIONS :

- The nullity of A is independent of the value of k.
- The nullity of A depends on the value of k, and the set of all possible values forthe nullity of A is {1, 2}.
- The nullity of A depends on the value of k, and the set of all possible values forthe nullity of A is {0, 1, 2, 3, 4, 5}.
- The nullity of A depends on the value of k, and the set of all possible values forthe nullity of A is {2, 3}.

Your score : 0

Discussions (0)

Question 3 : 6406531333377

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

Consider the following table.

Set of vectors (Column A)		Properties (Column B)	
a)	$\{(3,-2,4),(2,1,-1)\}$	i)	Orthonormal, but does not form a basis of $\mathbb{R}^3$
b)	$\left\{\frac{1}{\sqrt{11}}(3,1,1), \frac{1}{\sqrt{6}}(-1,1,2)\right\}$	ii)	Forms an orthogonal basis of $\mathbb{R}^3$
c)	$\{(1,2,-1),(5,-2,1),(0,1,2)\}$	iii)	Orthogonal but not orthonormal, and does not form a basis of $\mathbb{R}^3$

Choose the correct option which matches the given set of vectors with the appropriate properties.

OPTIONS :

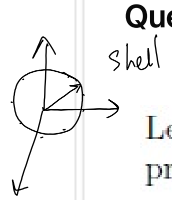
- a) → iii), b) → i), c) → ii)
- a) → ii), b) → i), c) → iii)
- a) → iii), b) → ii), c) → i)
- a) → ii), b) → iii), c) → i)

Your score : 0

Discussions (0)

Question 4 : 6406531333378

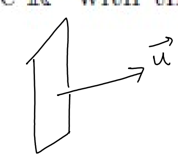
View Solutions (0) Total Mark : 6.00 | Type : MSQ



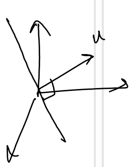
shell

$|u| =$

Let $u = (-1,2,-3)$ be a vector from the inner product space $\mathbb{R}^3$ with the usual inner product. Which of the following options is/are true?



OPTIONS :



- ☑ There exist infinitely many vectors $v \in \mathbb{R}^3$ such that $\|v\| = \|u\|$.
- ☒ The set of all vectors orthogonal to u will lie on a ~~line~~ plane ✓ passing through the origin.
- ☑ There exist infinitely many vectors $v \in \mathbb{R}^3$ such that $\langle u, v\rangle = 0$. $u^T v = 0$
- ☑ The set of all vectors orthogonal to u will form a subspace of $\mathbb{R}^3$.

Your score : 0

Discussions (0)

Question 5 : 6406531333379

View Solutions (0)

Total Mark : 3.00 | Type : SA

$y=-x \rightarrow$ Basis $= \{(1,-1)\} \rightarrow (1/\sqrt{2}, -1/\sqrt{2})$

Consider $W = \{(x,y) \in \mathbb{R}^2 : x + y = 0\}$ as a subspace of $\mathbb{R}^2$ with the usual inner product. Let (α, β) be the projection of the vector $(4,-2)$ on W. Find $\alpha - \beta$. $= 6$

$(3,-3)$

Answer (Numeric):

$Proj(4,-2) = \langle (4,-2), (1/\sqrt{2}, -1/\sqrt{2}) \rangle (1/\sqrt{2}, -1/\sqrt{2})$

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

$\frac{6}{\sqrt{2}}(1/\sqrt{2}, -1/\sqrt{2})$

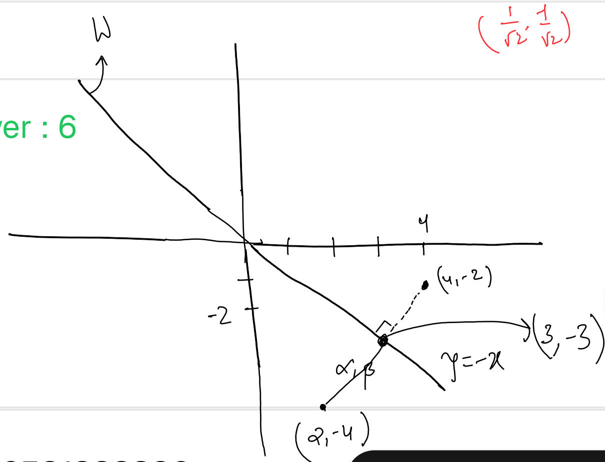
$\frac{6}{2}(1,-1) = (3,-3)$

Answer

Accepted Answer : 6

Your score : 0

$\frac{4+2}{2}, \frac{-4-2}{2}$



Discussions (0)

Question 6 : 6406531333380

View Solutions (0)

Total Mark : 4.00 | Type : SA

Let $u = (1,1)$ and $v = (v_1, v_2)$ be vectors in $\mathbb{R}^2$ with the usual inner product. Suppose $\|v\| = 2$ and the angle between u and v is $45°$, find $v_1 + v_2$. $= 2$

$\frac{\langle (1,1), (v_1,v_2) \rangle}{\sqrt{2}\sqrt{v_1^2+v_2^2}} = \cos 45$

$\frac{v_1+v_2}{\cancel{\sqrt{2}}\, 2} = \frac{1}{\cancel{\sqrt{2}}}$

$v_1+v_2 = 2$

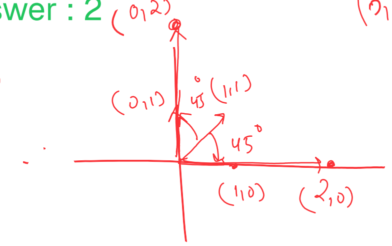
Answer (Numeric):

Answer

$(0,2)$ or $(2,0)$ is equal to $(v_1\ v_2)$

Accepted Answer : 2

Your score : 0



Discussions (0)

Question 7 : 6406531333381

View Solutions (0)

Total Mark : 5.00 | Type : SA

Consider $\mathbb{R}^2$ with the usual inner product. Let $T: \mathbb{R}^2 \to \mathbb{R}^2$ be an orthogonal transformation given by $T(x,y) = (ax + by, cx + dy)$ for all $x, y \in \mathbb{R}$ and A be the matrix representation of T with respect to the standard ordered basis. If $\boxed{a = 1}$ and $det(A) < 0$, find $b + c + d$.

$T(x,y) = \underbrace{\begin{bmatrix} a & b \\ c & d \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix}}_{\text{equal}}$ — $A = [T]_{std}^{std}$ $\begin{bmatrix} 1 & b \\ c & d \end{bmatrix}$

Answer (Numeric):

$d - bc < 0$

$AA^T = A^TA = I$

Answer

$\begin{pmatrix} 1 & b \\ c & d \end{pmatrix}\begin{pmatrix} 1 & c \\ b & d \end{pmatrix} = \begin{pmatrix} b^2+1 & c+bd \\ c+bd & d^2 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

$d - bc < 0$

$d < 0$

$b = 0$ $\quad d^2 = 1$ $\quad d = -1$

$c + bd = 0$

$c = 0$

Accepted Answer : -1

Your score : 0

Discussions (0)

Question 8 : 6406531333382

View Solutions (0) Total Mark : 5.00 | Type : SA

Let $T : \mathbb{R}^2 \to \mathbb{R}^2$ be the linear transformation determined by

$\begin{matrix} \alpha-6 & -4 \\ 3 & \alpha+1 \end{matrix}$

$$T(1,0) = (\alpha - 6, -4), \qquad T(0,1) = (3, \alpha + 1),$$

where $\alpha \in \mathbb{R}$. Let $\overset{2}{\alpha_1}$ and $\overset{3}{\alpha_2}$ be the minimum and maximum values, respectively, of α for which T fails to be injective. Find $\alpha_2^2 - \alpha_1^2$. $\quad 9-4=5$

$\hookrightarrow$ nullity $\neq 0 \longrightarrow$ not full rank $\longrightarrow \Delta = 0$

Answer (Numeric):

Answer

Accepted Answer : 5

Your score : 0

Discussions (0)

Question 9 : 6406531333383

Total Mark : 0.00 | Type : COMPREHENSION

Consider a linear transformation $T : \mathbb{R}^3 \to \mathbb{R}^3$ defined as: $A = \begin{pmatrix} 1 & 2 & 0 \\ 2 & -1 & \alpha \\ 3 & 1 & \beta \end{pmatrix}\begin{pmatrix} x \\ y \\ z \end{pmatrix} = T\begin{pmatrix} x \\ y \\ z \end{pmatrix}$

$$T(x, y, z) = (x + 2y, 2x - y + \alpha z, 3x + y + \beta z),$$

for all $x, y, z \in \mathbb{R}$, where $\alpha, \beta \in \mathbb{R}$. Let A be the matrix representation of T with respect to the standard bases for both the domain and the codomain.

Suppose A is similar to the matrix B given by $\begin{pmatrix} 1 & 2 & 3 \\ 4 & -5 & -6 \\ -5 & 3 & 3 \end{pmatrix}$. Based on the above information, answer the given subquestions.

Your score : 0

Question 10 : 6406531333384

View Parent QN | View Solutions (0)

Total Mark : 4.00 | Type : MSQ

Choose all the correct statements from the following.

rank (B) = rank (A) = rank (T)

OPTIONS :

- [ ] The rank of the linear transformation T is 2.
- [ ] The nullity of the linear transformation T is 2.
- [ ] The transformation T is invertible. ⟶ If full rank then Invertible
- [ ] T cannot be an isomorphism. nullity = 0 ⟶ 1-1
  and
  rank equal to domain ⟵ onto

Your score : 0

Discussions (0)

Question 11 : 6406531333385

View Parent QN | View Solutions (0)

Total Mark : 3.00 | Type : SA

If $\alpha = -2$, find β.

Answer (Numeric):

Answer

Accepted Answer : -2

Your score : 0

Discussions (0)

Question 12 : 6406531333386

Total Mark : 0.00 | Type : COMPREHENSION

Based on the above data, answer the given subquestions.

Let $T : \mathbb{R}^4 \to \mathbb{R}^2$ be the linear transformation defined by

$$T(x_1, x_2, x_3, x_4) = (x_1 + x_2,\ x_2 - x_3 + x_4),$$

for all $(x_1, x_2, x_3, x_4) \in \mathbb{R}^4$.

Def $\begin{bmatrix} 1 & 1 & 0 & 0 \\ 0 & 1 & -1 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix}$

Your score : 0

Question 13 : 6406531333387

View Parent QN View Solutions (0)

Total Mark : 2.00 | Type : SA

Find the number of columns in the matrix (with respect to any bases) of the linear transformation T.

Answer (Numeric):

Answer

Accepted Answer : 4

Your score : 0

Discussions (0)

Question 14 : 6406531333388

View Parent QN View Solutions (0)

Total Mark : 2.00 | Type : MCQ

Let A denote the matrix of the linear transformation T with respect to standard bases for both the domain and the codomain. Choose the correct statement from the following.

(In the options below, REF is used for row echelon form, and RREF is used for reduced row echelon form.)

OPTIONS :

- A is in REF and RREF.
- A is neither in RREF nor in REF.
- A is in RREF, but not in REF.
- A is in REF, but not in RREF.

Your score : 0

Discussions (0)

Question 15 : 6406531333389

View Parent QN View Solutions (0)

Total Mark : 3.00 | Type : SA

Find the value of k for which the set $\{(-1, 1, k^2, k-1), (1, -1, 0, 1)\}$ is a basis for the $\underbrace{\text{kernel of } T}_{\hookrightarrow \text{Null Space}}$.

Answer (Numeric):

Answer

Accepted Answer : 1

Your score : 0

Discussions (0)

Question 16 : 6406531333390

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 defined by

$$T(x, y, z) = (x + z, y, x + y + z),$$

for all $(x, y, z) \in \mathbb{R}^3$.

def $= \begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 1 \end{pmatrix}\begin{pmatrix} x \\ y \\ z \end{pmatrix}$

Your score : 0

Question 17 :
6406531333391

View Parent QN View Solutions (0)

Total Mark : 2.00 | Type : MCQ

Which of the following is the matrix of the linear transformation T with respect to standard bases for both the domain and the codomain.

OPTIONS :

- $\begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 0 & 1 \end{pmatrix}$
- $\begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 1 \end{pmatrix}$
- $\begin{pmatrix} 1 & 0 & 1 \\ 1 & 1 & 1 \\ 0 & 0 & 1 \end{pmatrix}$
- $\begin{pmatrix} 1 & 1 & 0 \\ 0 & 1 & 0 \\ 1 & 1 & 1 \end{pmatrix}$

Your score : 0

Discussions (0)

Question 18 :
6406531333392

View Parent QN View Solutions (0)

Total Mark : 5.00 | Type : MSQ

Which of the following spaces are isomorphic to the $\underbrace{\text{kernel of T}}_{\text{Null space}}$?

Same dim

OPTIONS :

- [ ] The trivial vector space $\{0\}$.
- [ ] The vector space of 2×2 diagonal matrices.
- [ ] The yz-plane in $\mathbb{R}^3$, i.e., $\{(0, y, z) \mid y, z \in \mathbb{R}\}$.
- [ ] The vector space of 2×2 scalar matrices.
- [ ] The space of solutions to $Ax = 0$, where A is an invertible matrix.
- [ ] The x-axis in $\mathbb{R}^3$, i.e., $\{(x, 0, 0) \mid x \in \mathbb{R}\}$.

Your score : 0

Discussions (0)

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