Exam : Quiz 2
Subject : Maths2
Total Marks : 25.00
QP : 2024 Dec01: IIT M AN EXAM QDF4

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
19 20 21 22

TIMER

00:34

CONTROLS

SUBMIT EXAM

Your Score

0.00 / 25.00

(0%)

Question 1 : 6406531026094

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

$y - z = \alpha - \gamma$

$x = \alpha + \gamma$

$\alpha = \frac{x+y-z}{2}$

$x = \alpha + \gamma$, $y = \alpha + \beta$, $z = \beta + \gamma$

$x - y = \gamma - \beta$

$z = \gamma + \beta$

$\frac{x-y+z}{2} = \gamma$

$T(x,y,z) = \frac{x+y-z}{2}(1,-1) + \frac{y+z-x}{2}(1,0) + \frac{x-y+z}{2}(1,1)$

Discussions (0)

$(x,y,z) = \underset{\frac{x+y-z}{2}}{\alpha}(1,1,0) + \underset{\frac{y+z-x}{2}}{\beta}(0,1,1) + \underset{\frac{x-y+z}{2}}{\gamma}(1,0,1)$ $T(x,y,z)$ DIY

Question 2 : 6406531026095

Total Mark : 0.00 | Type : COMPREHENSION

Based on the above data, answer the given subquestions.

Let $T: \mathbb{R}^3 \to \mathbb{R}^2$ be a linear transformation such that $T(1,1,0) = (1,-1)$, $T(0,1,1) = (1,0)$, $T(1,0,1) = (1,1)$. If $T(3,-1,4) = (a,b)$

Your score : 0

① Find $T(x,y,z)$ ✓

② Find $T(3,-1,4) = (a,b)$

Question 3 : 6406531026096

View Parent QN View Solutions (0)

Total Mark : 1.00 | Type : SA

Find a.

Answer (Numeric):

Answer

Accepted Answer : 3

Your score : 0

Discussions (0)

Question 4 : 6406531026097

View Parent QN | View Solutions (0)

Total Mark : 1.00 | Type : SA

Find b.

Answer (Numeric):

Answer

Accepted Answer : 5

Your score : 0

Discussions (0)

Question 5 : 6406531026098

View Parent QN | View Solutions (0)

Total Mark : 1.00 | Type : SA

Is T injective or surjective? If T is injective, write the answer as 1 and if T is surjective, write the answer as -1.

Answer (Numeric):

Answer

Accepted Answer : -1

Your score : 0

Discussions (0)

Question 6 : 6406531026106

Total Mark : 0.00 | Type : COMPREHENSION

Based on the above data, answer the given subquestions.

Let $A = \begin{bmatrix} k & -3 \\ 1 & 2-k \end{bmatrix}$, where k is a positive real number. Let I_2 denote the identity matrix of order 2.

Your score : 0

Question 7 : 6406531026107

View Parent QN | View Solutions (0)

Total Mark : 1.00 | Type : SA

If A is equivalent to I_2, then find the rank of A.

Answer (Numeric):

Answer

Accepted Answer : 2

Your score : 0

Discussions (0)

Question 8 : 6406531026108

View Parent QN | View Solutions (0)

Total Mark : 1.00 | Type : SA

rank

$[\;=\;]_{2*2}$

Find the value of k for which A is not equivalent to I_2. $\rightarrow$ rank $= 2$

$\rightarrow$ we don't want rank $= 2$

rank $< 2 \longrightarrow$ det $= 0$

Answer (Numeric):

Answer

Accepted Answer : 3

Your score : 0

Discussions (0)

Question 9 : 6406531026109

View Parent QN | View Solutions (0)

Total Mark : 1.00 | Type : SA

Find the number of values of k for which A is similar to I_2.

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

det = 1
trace = same
rank = same

$k(2-k)+3=1$ trace ✓

$2k-k^2+2=0$

$k^2-2k+2=0 \rightarrow$ No soln

$b^2-4(2)$

$4-8<0$

Answer (Numeric):

Answer

Accepted Answer : 0 not available

Your score : 0

Discussions (0)

Question 10 : 6406531026111

Total Mark : 0.00 | Type : COMPREHENSION

$\left(1/\sqrt{6}, 2/\sqrt{6}, 1/\sqrt{6}\right)$

Consider the following vectors in $\mathbb{R}^3$.

$$u_1 = \left(\frac{1}{\sqrt{3}}, -\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}\right), \quad u_2 = \left(\frac{1}{\sqrt{2}}, 0, -\frac{1}{\sqrt{2}}\right), \quad u_3 = \left(\frac{1}{\sqrt{6}}, \frac{2k}{\sqrt{6}}, \frac{k}{\sqrt{6}}\right),$$

where $k \in \mathbb{R}$. Answer the given subquestions using the standard inner product on $\mathbb{R}^3$.

unit $\frac{1}{6}+\frac{4k^2}{6}+\frac{k^2}{6}=1$

Your score : 0

$k=+1$ -1

$5k^2-5=0$

$k^2=1$

$k=\pm 1$

Question 11 : 6406531026112

View Parent QN | View Solutions (0)

Total Mark : 1.00 | Type : SA

Find the number of values of k for which the vector u_3 is a unit vector.

Answer (Numeric):

Answer

Accepted Answer : 2

Your score : 0

Discussions (0)

Question 12 : 6406531026113

View Parent QN View Solutions (0)

Total Mark : 1.00 | Type : SA

Find the value of k for which $\{u_1, u_2, u_3\}$ is an orthonormal basis of $\mathbb{R}^3$.

Answer (Numeric):

Answer

Accepted Answer : 1

Your score : 0

Discussions (0)

Question 13 : 6406531026114

View Parent QN View Solutions (0)

Total Mark : 1.00 | Type : SA

For $k = 0$, find the angle (in degrees) between u_2 and u_3.

Answer (Numeric):

Answer

Accepted Answer : 45

Your score : 0

Discussions (0)

Question 14 : 6406531026099

View Solutions (0)

Total Mark : 3.00 | Type : MCQ

n=m

Let $T\colon \mathbb{R}^n \to \mathbb{R}^m$ be a linear transformation. Choose the correct option that guarantees that T is bijective:

OPTIONS :

square

- $m = n.$

Incomplete correct option

- T maps a basis of $\mathbb{R}^n$ to a basis of $\mathbb{R}^m$.
- The matrix representation of T with respect to any ordered basis is square and invertible.

Complete correct option

- $rank(T) = m.$

Your score : 0

Discussions (0)

Question 15 : 6406531026100

Total Mark : 0.00 | Type : COMPREHENSION

Based on the above data, answer the given subquestions.

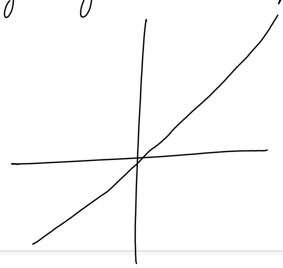
Let $T\colon \mathbb{R}^2 \to \mathbb{R}^3$ be a linear transformation given by $T(x, y) = (2x - 3y, -x + 5y, x + y)$.

$-y \quad 4y \quad 2y$

$x=y\}S$

Your score : 0

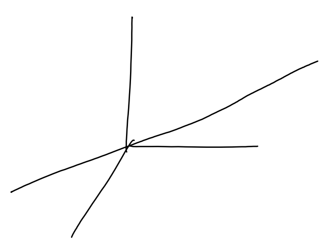
$y(-1,4,2)$



$T(S) = (-x, 4x, 2x)$

$=$

dim 1



Question 16 : 6406531026101

View Parent QN | View Solutions (0)

Total Mark : 1.00 | Type : SA

Let S be any straight line in $\mathbb{R}^2$ passing through the origin. If $T(S)$ represents the image of S under T in $\mathbb{R}^3$, what is the dimension of the subspace $T(S)$?

Answer (Numeric):

Answer

Accepted Answer : 1

Your score : 0

Discussions (0)

Question 17 : 6406531026102

View Parent QN | View Solutions (0)

Total Mark : 1.00 | Type : MCQ

$T(x,y) = (2x-3y,\ -x+5y,\ x+y)$

$[T]_{\beta_1}^{\beta_2}$

Let $\mathcal{B}_1 = \{(1,-1),(0,2)\}$ and $\mathcal{B}_2 = \{(1,0,0),(0,1,0),(0,0,1)\}$. Which of the following matrices is the matrix representation of T with respect to the basis $\mathcal{B}_1$ for domain and $\mathcal{B}_2$ for co-domain.

$T(1,-1) = (5,-6,0) = 5(1,0,0) + -6(0,1,0) + 0(0,0,1)$

$T(0,2) = (-6,10,2) = -6 \quad 10 \quad 2$

$$\begin{pmatrix} 5 & -6 \\ -6 & 10 \\ 0 & 2 \end{pmatrix}$$

$\downarrow$

$$\begin{pmatrix} 1 & -6/5 \\ 1 & -10/6 \\ 0 & 2 \end{pmatrix}$$

$$\begin{pmatrix} 1 & -6/5 \\ 0 & -10/6+6/5 \\ 0 & 2 \end{pmatrix} \rightarrow \begin{pmatrix} 1 & -6/5 \\ 0 & 1 \\ 0 & 1 \end{pmatrix}$$

$\downarrow$

$$\begin{pmatrix} 1 & -6/5 \\ 0 & 1 \\ 0 & 0 \end{pmatrix}$$ rank = 2, nullity = 0

OPTIONS :

- $\begin{bmatrix} 5 & -6 & 0 \\ -6 & 10 & 2 \end{bmatrix}$
- $\begin{bmatrix} -1 & 4 & 0 \\ -6 & 10 & 2 \end{bmatrix}$

$$\begin{bmatrix} 5 & -6 \\ -6 & 10 \\ 0 & 2 \end{bmatrix}$$

$$\begin{bmatrix} -1 & -6 \\ 4 & 10 \\ 0 & 2 \end{bmatrix}$$

Your score : 0

Discussions (0)

Question 18 : 6406531026103

View Parent QN View Solutions (0)

Total Mark : 1.00 | Type : SA

What is the rank of T ?

Answer (Numeric):

Answer

Accepted Answer : 2

Your score : 0

Discussions (0)

Question 19 : 6406531026104

View Parent QN View Solutions (0)

Total Mark : 1.00 | Type : SA

What is the nullity of T ?

Answer (Numeric):

Answer

Accepted Answer : 0

Your score : 0

Discussions (0)

Question 20 : 6406531026105

View Solutions (0)

Total Mark : 3.00 | Type : MSQ

Let $V = span\{(3,0,0),(0,-2,2),(-1,1,-1)\}$. Let $T: V \to \mathbb{R}^2$ be a linear transformation defined by $T(x,y,z) = (x - cy, y + z)$. Choose all the correct options from the following:

$= \begin{bmatrix} 1 & -c & 0 \\ 0 & 1 & 1 \end{bmatrix} \to$ rank $= 2 \ \forall c$

OPTIONS :

- T is not one-one for any value of c.

nullity $= 1 \neq 0$ then Not 1-1

- T is ~~one-one~~ when $c = 0$.

If $c = 0$

$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \end{bmatrix} \to$ rank $= 2$

- $rank(T) = 1$ for all values of c.

$(3\alpha, -2\beta, 2\beta) = (3\alpha - c(-2\beta), 0)$

$(3\alpha + 2c\beta, 0)$

- $nullity(T) = 2$ for some c.

- There exist non-zero real numbers α and β such that $\alpha(3,0,0)+\beta(0,-2,2)$ is in $ker(T)$.

c, α, β st $= 0$

Your score : 0

Discussions (0)

Question 21 : 6406531026110

View Solutions (0)

Total Mark : 3.00 | Type : MSQ

Consider the system of equations given by $Ax = b$, where A is an $m \times n$ matrix and b is a vector in $\mathbb{R}^m$. Choose all the correct options that guarantee that the set of solutions to the given system of equations is an affine subspace of $\mathbb{R}^n$.

$Ax = 0$ if $x = 0$

OPTIONS :

$Ax = 0$

$x = (0,0,0)$ trivial soln

Homogeneous

- $b = 0$.

$a_1 \quad x_2 \quad x_3$

$b \in \left\{ x_1 \begin{pmatrix} 1 \\ c_1 \\ 1 \end{pmatrix} + x_2 \begin{pmatrix} 1 \\ c_2 \\ 1 \end{pmatrix} + x_3 \begin{pmatrix} 1 \\ c_3 \\ 1 \end{pmatrix} \right\}$

- b is in the column space of A.

guarantee soln

- [ ] $rank(A) = n.$

$A \ m \times n$

$T: V^n \longrightarrow V^m$

- [ ] $m = n$ and A is an invertible matrix.

Your score : 0

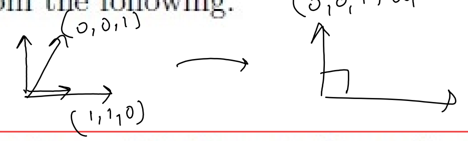
Discussions (0)

Question 22 : 6406531026115

View Solutions (0)

Total Mark : 3.00 | Type : MSQ

Let W denote the subspace of $\mathbb{R}^3$ spanned by the vectors $u_1 = (1,1,0)$ and $u_2 = (0,0,1)$. Let $P_W : \mathbb{R}^3 \to \mathbb{R}^3$ denote the linear transformation which maps every vector to its projection (with respect to the standard inner product on $\mathbb{R}^3$) on to the subspace W. Choose all the correct statements from the following.



OPTIONS :

$P_{u_1}(0,1,1) + P_{u_2}(0,1,1) = P_W(0,1,1)$

- [ ] The Gram-Schmidt process starting with the set $\{u_1, u_2\}$ yields the orthonormal basis $\left\{\frac{1}{\sqrt{2}}(1,1,0), \frac{1}{\sqrt{2}}(0,0,1)\right\}$ of W.

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

$0(\ ) = (0,0,0)$

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

- [ ] $P_W(0,1,1) = \left(\frac{1}{2}, \frac{1}{2}, 1\right)$

- [ ] The nullity of P_W is 1.

should not change length

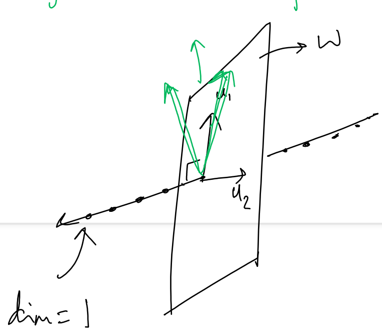
- [ ] P_W is an orthogonal transformation.

No guarantee vector length is same as shadow length

Your score : 0

P_W

which points will give 0 projection



Discussions (0)

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