Exam :	Quiz 2
Subject :	Maths2
Total Marks :	25.00
QP :	2024 Mar24: IIT M AN EXAM QDD4

Exam Mode Learning Mode

QUESTION MENU

1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18
19 20 21 22 23 24 25 26

TIMER

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CONTROLS

SUBMIT EXAM

Your Score

0.00 / 25.00

(0%)

Question 1 : 640653771044

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)

$T(x,y) = xT(1,0) + yT(0,1)$

$=$

Question 2 : 640653771045

Total Mark : 0.00 | Type : COMPREHENSION

$T(2,1) = 2T(1,0) + 1T(0,1) = 2(a,b) + 1(c,d)$

$= (2a+c, 2b+d) = (-1,-3)$

Based on the above data, answer the given subquestions.

$T : \mathbb{R}^2 \to \mathbb{R}^2$ is a linear transformation given by $T(2,1) = (-1,-3)$ and $T(1,2) = (-5,0)$. The matrix representation of T with respect to the standard ordered basis $\beta = \{(1,0),(0,1)\}$ is $\begin{bmatrix} a & c \\ b & d \end{bmatrix}$.

$2\alpha + \beta = x \rightarrow (1)$

$\alpha + 2\beta = y$

$2\alpha + 4\beta = 2y$

$T(x,y) = \alpha(2,1) + \beta(1,2)$

$= \frac{2x-y}{3}T(2,1) + \frac{2y-x}{3}T(1,2)$

$3\beta = 2y - x$

$\beta = \frac{2y-x}{3}$

Your score : 0

$T(x,y) = \frac{2x-y}{3}(-1,-3) + \frac{2y-x}{3}(-5,0)$

$\alpha = y - 2\left(\frac{2y-x}{3}\right)$

$= \frac{3y-4y+2x}{3} = \frac{2x-y}{3}$

$= (x-3y, \; y-2x)$

1

-2

-3

1

Question 3 : 640653771046

View Parent QN

View Solutions (1)

$\begin{bmatrix} 1 & -3 \\ -2 & 1 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix}$ $\quad \frac{y-2x}{3} + \frac{5x-10y}{3} = \frac{3x-9y}{3}$

Total Mark : 1.00 | Type : SA

$x - 3y$

Find the value of a.

Answer (Numeric):

Answer

Accepted Answer : 1

Your score : 0

Discussions (0)

Question 4 :
640653771047

View Parent QN
View Solutions (1)

Total Mark : 1.00 | Type : SA

Find the value of b.

Answer (Numeric):

Answer

Accepted Answer : -2

Your score : 0

Discussions (0)

Question 5 :
640653771048

View Parent QN
View Solutions (1)

Total Mark : 1.00 | Type : SA

Find the value of c.

Answer (Numeric):

Answer

Accepted Answer : -3

Your score : 0

Discussions (0)

Question 6 :
640653771049

View Parent QN
View Solutions (1)

Total Mark : 1.00 | Type : SA

Find the value of d.

Answer (Numeric):

Answer

Accepted Answer : 1

Your score : 0

Discussions (0)

Question 7 : 640653771063

Total Mark : 0.00 | Type : COMPREHENSION

$x\begin{pmatrix} 1 & -1 \\ 0 & 0 \end{pmatrix} + y\begin{pmatrix} 0 & 0 \\ 1 & -1 \end{pmatrix}$ dim = 2

Let $V = \left\{ \begin{pmatrix} x & -x \\ y & -y \end{pmatrix} : x, y \in \mathbb{R} \right\}$ and $T: V \to \mathbb{R}^3$ be a linear transformation given by $T\left(\begin{pmatrix} x & -x \\ y & -y \end{pmatrix}\right) = (x, y, x+y)$. Based on this information, answer the given subquestions.

$T(x,y) = (x, y, x+y) = \begin{pmatrix} x \\ y \\ x+y \end{pmatrix}$

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

rank = $2 \neq 3$ so not onto

nullity = 0 $\longrightarrow$ 1-1

Your score : 0

Question 8 : 640653771064

View Parent QN | View Solutions (0)

Total Mark : 2.00 | Type : MCQ

Choose the correct option(s) from the following:

OPTIONS :

- T is one-one and onto.
- T is one-one but not onto.
- T is not one-one but onto.
- T is neither one-one nor onto.

Your score : 0

Discussions (0)

Question 9 : 640653771065

View Parent QN | View Solutions (0)

Total Mark : 2.00 | Type : MSQ

Choose the correct option(s) from the following:

$x\begin{pmatrix} 1 & 1 \\ 0 & 0 \end{pmatrix} + y\begin{pmatrix} 0 & 0 \\ 1 & -1 \end{pmatrix}$

OPTIONS :

- [ ] A basis of V is given by $\left\{\begin{pmatrix} 1 & -1 \\ 1 & -1 \end{pmatrix}, \begin{pmatrix} 1 & -1 \\ 0 & 0 \end{pmatrix}, \begin{pmatrix} 0 & 0 \\ 1 & -1 \end{pmatrix}\right\}$.
- [ ] Any matrix in V has rank less than or equal to 1.

rank = 0

$\begin{pmatrix} x & -x \\ y & -y \end{pmatrix}$

- [ ] Rank(T) is 2.
- [ ] dim(V) is 3.

2

Your score : 0

Discussions (0)

Question 10 : 640653771050

Total Mark : 0.00 | Type : COMPREHENSION

Let V and W be two vector spaces. Suppose there exists an isomorphism T from V to W Based on the above data, answer the given subquestions.

Your score : 0

Question 11 : 640653771051

View Parent QN | View Solutions (1)

Total Mark : 1.00 | Type : MCQ

Which of the following statements is true?

OPTIONS :

- ( ) dim(V) = dim(W)

◯ dim(V) < dim(W)

◯ dim(V) > dim(W)

◯ Insufficient information

Your score : 0

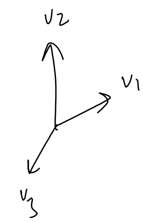
Discussions (0)

Question 12 : 640653771052

View Parent QN | View Solutions (0)

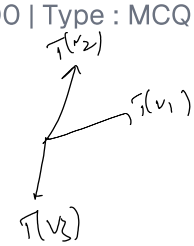
Total Mark : 1.00 | Type : MCQ

Is the following statement true or false?
If $\{v_1, v_2, v_3\}$ are linearly independent vectors in V, then $\{T(v_1), T(v_2), T(v_3)\}$ are linearly independent vectors in W.



Indep

Since T is iso



there are also independent

OPTIONS :

◯ TRUE

◯ FALSE

Your score : 0

Discussions (0)

Question 13 : 640653771053

View Parent QN | View Solutions (1)

Total Mark : 1.00 | Type : MCQ

Is the following statement true or false?

Let $\{u_1, u_2, u_3\} \subset V$. If $\{T(u_1), T(u_2), T(u_3)\}$ is a linearly independent set in W, then $\{u_1, u_2, u_3\}$ is not necessarily a linearly independent set in V. In other words, $\{u_1, u_2, u_3\}$ could also be linearly dependent in V.

Since T is Iso

u_1, u_2, u_3 also L. Indep

$T(u_1)$ $T(u_2)$ $T(u_3)$ and L. Indep

OPTIONS :

- TRUE
- FALSE

Your score : 0

Discussions (0)

Question 14 : 640653771054

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 a linear transformation given by:

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

Your score : 0

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

rank = 2 ≠ 3 So not onto

nullity = 1 ≠ 0 So not into

Question 15 : 640653771055

View Parent QN

View Solutions (1)

Total Mark : 1.00 | Type : SA

$$\begin{pmatrix} 1 & -1 & 0 \\ 0 & 1 & -1 \\ 0 & 0 & 0 \end{pmatrix} \to \begin{pmatrix} 1 & 0 & -1 \\ 0 & 1 & -1 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix}$$

$x = z$

$y = z$

Find the nullity of T.

Null Space (z, z, z)

(x, x, x)

$(1, 1, 1)$

Answer (Numeric):

Answer

Accepted Answer : 1

Your score : 0

Discussions (0)

Question 16 :
640653771056

View Parent QN | View Solutions (0)

Total Mark : 1.00 | Type : MCQ

Which of the following is a basis for the kernel of T?

OPTIONS :

- ○ $\{(1,1,1)\}$
- ○ $\mathrm{span}\{(1,1,1)\}$
- ○ $\{(a,a,a) \mid a \in \mathbb{R}\}$
- ○ $\{(1,0),(0,1)\}$
- ○ $\{(1,0,0),(0,1,0)\}$

Your score : 0

Discussions (0)

RREF ✓

CREF

$\{c_1\ c_2\}$ Basis's

Span(c_1, c_2, c_3)

$\begin{pmatrix}1\\0\\-1\end{pmatrix}\begin{pmatrix}-1\\1\\0\end{pmatrix}\begin{pmatrix}0\\-1\\1\end{pmatrix}$ Col Space

Question 17 :
640653771057

View Parent QN | View Solutions (0)

Total Mark : 1.00 | Type : MCQ

Which of the following is a basis for the image of T?

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

OPTIONS :

- ∅ $\{(1,0,-1),(-1,1,0)\}$

$\begin{bmatrix}1 & 0 & -1\\-1 & 1 & 0\\0 & -1 & 1\end{bmatrix} \longrightarrow \begin{bmatrix}1 & 0 & -1\\0 & 1 & -1\\0 & -1 & 1\end{bmatrix} \to \begin{bmatrix}1 & 0 & -1\\0 & 1 & -1\\0 & 0 & 0\end{bmatrix}$

why 3rd row is zero vector?

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

Your score : 0

Discussions (0)

Question 18 : 640653771059 Total Mark : 0.00 | Type : COMPREHENSION

$(2,1,3) = (3,1,2) - (1,0,-1)$

domain

Based on the above data, answer the given subquestions.

Let $W = span\{\underbrace{(1,0,-1),(3,1,2),(2,\cancel{1},3)}_{\dim W = 2}\}$ and P_W be the projection of $\mathbb{R}^3$ onto W.

Your score : 0

1 0 -1
3 1 2
2 1 3

W dim = ~~3~~

Rank + nullity = 3

1

always onto → rank = dim of codomain

Question 19 : 640653771060

View Parent QN View Solutions (0)

Total Mark : 1.00 | Type : SA

What is rank of P_W?

Answer (Numeric):

Answer

Accepted Answer : 2

Your score : 0

Discussions (0)

Question 20 : 640653771061

View Parent QN | View Solutions (0)

Total Mark : 1.00 | Type : SA

What is nullity of P_W?

Answer (Numeric):

Answer

Accepted Answer : 1

Your score : 0

Discussions (0)

3

$W = (x, y, z)$

$\dim W = 2$

Question 21 : 640653771062

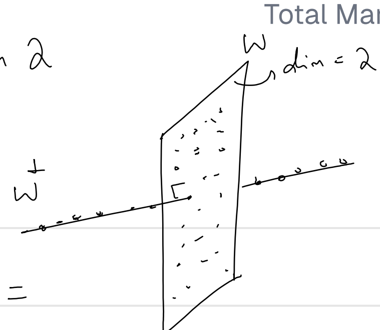
$W^{\perp}$

View Parent QN | View Solutions (0)

Total Mark : 1.00 | Type : SA

$W = \dim 2$

What is $dim(W^{\perp})$?



Answer (Numeric):

Answer

$\dim W + \dim W^{\perp} =$

$\dim$ of parent space $\mathbb{R}^3$

Accepted Answer : 1

Your score : 0

Discussions (0)

Question 22 : 640653771067

Total Mark : 0.00 | Type : COMPREHENSION

Answer the given subquestions:

Your score : 0

equivalent ↓ rank same ∃ inv P, Q s.t. $B = PAQ$

Similar sq All prop of equi and det = same ↓ If Similar → rank, det, trace equal

Converse is not true

Question 23 : 640653771068

Same rank, det, trace

View Parent QN | View Solutions (0)

Total Mark : 1.00 | Type : SA

Let A and B be $n \times n$ similar matrices. Suppose A has exactly $n-1$ linearly independent columns, then $det(B)$ is equal to ____.

also 0

$$A = \begin{bmatrix} | & | & | \\ c_1 & c_2 & c_3 \\ | & | & | \end{bmatrix}_{3\times 3} \quad \text{not independent}$$

det prop in 12th class →

$$\left| \begin{bmatrix} | & | & | \\ c_1 & c_2 & \alpha c_1 + \beta c_2 \\ | & | & | \end{bmatrix} \right|$$

$$\left| \begin{bmatrix} | & | & | \\ c_1 & c_2 & \alpha c_1 \\ | & | & | \end{bmatrix} \right| + \left| \begin{bmatrix} | & | & | \\ c_1 & c_2 & \beta c_2 \\ | & | & | \end{bmatrix} \right|$$

$$0 + 0$$

Answer (Numeric):

Answer

Accepted Answer : 0

Your score : 0

Discussions (0)

$Ax = b$

$b = 0$ $b \notin$ Colspace $b \in$ Col Space(A)

Question 24 : 640653771069

View Parent QN | View Solutions (0)

Total Mark : 1.00 | Type : SA

Let A be a 5×5 matrix of rank 3. Let b be the third column of A and W be the affine subspace of $\mathbb{R}^5$ given by $W = \{x \in \mathbb{R}^5 : Ax = b\}$. What is the dimension of W?

Soln Space $Ax = b$

$$A = \begin{bmatrix} & | & \\ & b & \\ & | & \end{bmatrix}_{5\times 5}$$

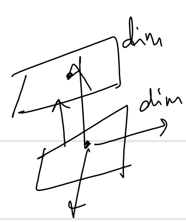
$b \in$ Col Space(A)

$Ax = 0$ → Null space of A

Affine $= \{\text{Null space} + v\}$

↓

Soln space of $Ax = b$



Answer (Numeric):

Answer

Accepted Answer : 2

Your score : 0

Discussions (0)

Question 25 : 640653771058

View Solutions (0)

Total Mark : 2.00 | Type : MSQ

Select all true statement(s).

$r(A^T) = r(A)$

OPTIONS :

$\le \min(\text{rank}(A), \text{rank}(B))$

$\le k, n$

- [ ] A and B are square matrices of order n. If rank$(A) = k$, with $k \leqslant n$, and rank$(B) = n$, then rank$(AB) = k$.

rows

- [ ] The rank of a matrix is equal to the maximum number of linearly independent columns.

$\begin{bmatrix} d_1 & 0 & 0 \\ 0 & d_2 & 0 \\ 0 & 0 & 0 \end{bmatrix}$

- [ ] The rank of a diagonal matrix is equal to the number of diagonal entries that are zero. no zero

$T.\ n \to m$

- [ ] For a matrix A of dimensions $m \times n$, rank(A) + nullity$(A) = m$.

n

domain

Your score : 0

Discussions (0)

Question 26 : 640653771066

View Solutions (0)

Total Mark : 4.00 | Type : MSQ

Choose the correct option(s) from the following:

$AA^T = A^TA = I$

$BB^T = B^TB = I$

A orth $A^T = A^{-1}$

$A^{-1^T} = (A^{-1})^T = A$

$(A^{-1})(A^{-1})^T$

$A^{-1}A = I$

OPTIONS :

$AA^T = A^TA$

$(AB)(AB)^T = ABB^TA^T = AA^T = I$

- [x] If A and B are orthogonal matrices, then AB is also orthogonal.
- [x] If A is orthogonal, then A^{-1} is also an orthogonal matrix.
- [ ] Let A be an $n \times n$ orthogonal matrix. Let R be the set of rows of A, thought of as a subset of R^n. Similarly, let C be the set of columns of A. Then exactly one of R or C is an orthogonal subset of vectors.

$\{c_1, c_2\}$

$\{c_1, c_3\}$

- [ ] If A is an $n \times n$ orthogonal matrix, then $\|Ax\| = \|x\|$ for any $x \in \mathbb{R}^n$.

only rotate

not change the length

Your score : 0

$\|Ax\|^2 = \langle Ax, Ax \rangle$
$= (Ax)^T Ax = x^T A^T A x = x^T I x$
$= x^T x$
$= \langle x, x \rangle$
$= \|x\|^2$

$\|Ax\|^2 = \|x\|$

$\|Ax\| = \|x\|$

Discussions (0)

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