Mid-semester Examination (Remote mode) 2021

PH110: Waves and Electromagnetics

Time: 40 Minutes **Marks: 36**

- **All questions are compulsory and their marks is indicated in square bracket.**
- **All questions needs to be answered sequentially without fail. Non-compliance of instruction will invite deduction in marks.**
- **In case you feel any question/s is/are incorrect or have insufficient instruction then write in the answer book with your justification without wasting any time**
- **Submission Time: 10:40 AM -11:00 AM (Only PDF files, no other form of submission is allowed)**
- **Submission Link:** https://forms.gle/A9h9BfXbSAL6XpUi7
- **File Name: 20205XYYY_Name_PHY110**

1.

(a) Show that $\vec{F} = yz\,\hat{x} + zx\,\hat{y} + xy\,\hat{z}$ can be expressed as the curl of a vector and as gradient of a scalar. Find the scalar and vector potentials for this function.

(b) Let us consider a function $\Theta(z) = \begin{cases} 1, & \text{if } z > 0 \\ 0, & \text{if } z \leq 0 \end{cases}$. Show the first order derivative of $\Theta(z)$ is equal to $\delta(z)$.

[6+4=10 Marks]

2.

Let $\vec{F} = \frac{1}{4\pi\epsilon_0} \cdot \frac{q_1 q_2}{r^2}\left[1 + \frac{r}{\lambda}\right] e^{-r/\lambda}\,\hat{r}$ REPRESENTS THE FORCE OF ATTRACTION BETWEEN TWO POINT CHARGES AND 'λ' IS A CONSTANT.

(a) USING THIS, CALCULATE ELECTRIC FIELD OF A CHARGE DISTRIBUTION. DOES THIS FIELD ADMIT SCALAR POTENTIAL? EXPLAIN.

(b) WITH THIS MODIFIED FORCE FORM, DOES GAUSS LAW CHANGES? EXPLAIN YOUR ANSWER.

[5+5=10 Marks]

3.

A PURE DIPOLE 'p' IS SITUATED AT THE ORIGIN, POINTING IN THE Z-DIRECTION. (a) WHAT IS THE FORCE ON A POINT CHARGE "4q" AT (4,0,0) CARTESIAN COORDINATES? (b) WHAT IS THE FORCE ON "4q" at (0,0,4)? HOW MUCH WORK DOES IT TAKE TO MOVE "4q" FROM (4,0,0) TO (0,0,4)?

[6 Marks]

4.

(i) DISCUSS THE IMPACT OF ELECTRIC FIELD ON DIELECTRICS. DOES THE GAUSS'S LAW AND BOUNDARY CONDITIONS REMAIN SAME FOR CONDUCTOR AND DIELECTRIC?

(ii) EXPRESS ATOMIC POLARIZIBILITY IN TERMS OF ELECTRICAL SUSCEPTIBILITY. JUSTIFY YOUR ANSWER.

[5*2=10 Marks]

End

End-semester Examination (Remote mode) 2021

PH110: Waves and Electromagnetics

Time: 60 Minutes **Marks: 60**

- **All questions are compulsory and their marks is indicated in square bracket.**
- **<u>All questions needs to be answered sequentially</u> without fail. Non-compliance of instruction will invite deduction in marks.**
- **In case you feel any question/s is/are incorrect or have insufficient instruction then write in the answer book with your justification without wasting any time**
- **Submission Time: 10:30 AM -10:45 AM (Only PDF files, no other form of submission is allowed)**
- **Submission Link:** https://forms.gle/VZQnMNrHxZx1pH8Y8
- **File Name: 20205XYYY_Name_PHY110**

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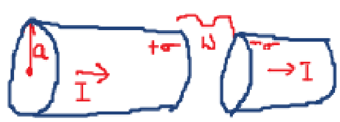
1. **[6+9=15 Marks]**

(a) STATE THE DIFFERENTIAL FORM OF MAXWELL'S EQU^N FOR FREE SPACE AND CONDUCTORS. USING THE INTEGRAL FORM OF MAXWELL'S EQU^N, COMPARE THE BOUNDARY CONDITIONS FOR BOTH CASES.

(b) CONSIDER THE CHARGING OF A CAPACITOR GIVEN BELOW.



(i) FIND THE $\vec{E}$ and $\vec{B}$ in the gap as the function of time 't' and distance (s) from the axis.

(ii) Find the energy density and Poynting Vector in the gap.

(iii) Calculate total power flowing into the gap.

2. **[9+6=15 Marks]**

(a) THE MAGNITUDE OF $\vec{J}_b$ AND $\vec{K}_b$ DEPENDS ON --------?

DISCUSS THE AMPERE LAW & IMPACT OF BOUND CURRENT ON AMPERE'S LAW?

(b) IMAGINE A UNIFORM MAGNETIC FIELD POINTING IN THE Z-DIRECTION AND FILLING ALL SPACE ($\vec{B} = B_0\hat{z}$). A POSITIVE CHARGE ON REST, AT ORIGIN NOW, MAGNETIC FIELD IS TURNED OFF, THEREBY INDUCING ELECTRIC FIELD? IN WHAT DIRECTION DOES THE CHARGE MOVE?

3. **[8+7=15 Marks]**

(a) DISCUSS THE PHYSICAL SIGNIFICANCE OF EQUATION OF CONTINUITY. CONSIDER BOTH MAGNETOSTATIC AND ELECTRODYNAMIC SCENARIOS.

(b) WHAT DO YOU UNDERSTAND FROM MAGNETIC VECTOR POTENTIAL? SHOW THAT MAGNETIC FIELD OF A DIPOLE CAN BE WRITTEN IN CO-ORDINATE FREE FORM.

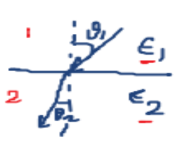
$$\vec{B}_{dip}(\vec{r}) = \frac{\mu_0}{4\pi}\frac{1}{r^3}\left[3(\vec{m}\cdot\hat{r})\hat{r} - \vec{m}\right].$$

Symbols have usual physical meaning.

4. **[10+5=15 Marks]**

(a) BOUND AND FREE CHARGES ARE NOT SAME. (TRUE/FALSE) JUSTIFY YOUR ANSWER. FURTHER, DISCUSS IMPACT OF BOUND CHARGES ON GAUSS'S LAW & BOUNDARY CONDITIONS.

(b) AT THE INTERFACE BETWEEN ONE LINEAR DIELECTRIC AND ANOTHER, THE ELECTRIC FIELD LINES BEND. SHOW THAT



$$\frac{\tan\theta_2}{\tan\theta_1} = \frac{\epsilon_2}{\epsilon_1}$$

WITH $\rho_f = 0$.

End

Started on	Friday, 8 January 2021, 5:00 PM
State	Finished
Completed on	Friday, 8 January 2021, 5:40 PM
Time taken	40 mins
Grade	**12.33** out of 30.00 (**41**%)

Question **1**

Incorrect

Mark 0.00 out of 1.00

Let $AX = b$ be a linear system with dimension of $A = m \times n$ and $m > n$. Then

- a. solution may exists
- b. it never has a solution. ✖
- c. it has infinitely many solutions

Your answer is incorrect.

The correct answer is:
solution may exists

Question **2**

Correct

Mark 1.00 out of 1.00

Let $A_{5 \times 5}$ be a matrix of coefficients with 5 pivot columns. Then $AX = b$ has

- a. solution depends on b.
- b. infinitely many solutions
- c. unique solution ✔
- d. no solution

Your answer is correct.

The correct answer is: unique solution

Question **3**

Correct

Mark 1.00 out of 1.00

Consider the matrix $A = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ Which of the following b in $Col(A)$?

- a. $b = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$
- b. $b = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$
- c. $b = \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}$
- d. $b = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$ ✔

Your answer is correct.

The correct answers are:

$b = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$

,

$b = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$

,

$b = \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}$

Question **4**

Correct

Mark 1.00 out of 1.00

Choose correct statements from following options

- [ ] a. Two matrices are row equivalent if they have the same number of rows.
- [x] b. Elementary row operations on an augmented matrix never change the solution set of the associated linear system. ✔
- [ ] c. An inconsistent system has more than one solution.
- [x] d. Two linear systems are equivalent if they have the same solution set. ✔

Your answer is correct.

The correct answers are:
Elementary row operations on an augmented matrix never change the solution set of the associated linear system.,

Two linear systems are equivalent if they have the same solution set.

Question **5**

Incorrect

Mark 0.00 out of 1.00

Two vectors are linearly dependent if and only if they lie on a same line.

Select one:

- (•) True ✖
- ( ) False

The correct answer is 'False'.

Question **6**

Incorrect

Mark 0.00 out of 1.00

Let W be the subset of $\mathbb{R}^3$ defined by $W = \{\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} \in \mathbb{R}^3 \mid 6x_1 + 5x_2 + 6x_3 = 0\}$ Which one of the following matrix A has $W = Nul(A)$, the null space of A.

- a. $\begin{bmatrix} 6 & 6 & 6 \\ 5 & 5 & 5 \\ 6 & 6 & 6 \end{bmatrix}$
- b. $\begin{bmatrix} 6 & 5 & 6 \\ 6 & 5 & 6 \\ 6 & 5 & 6 \end{bmatrix}$
- c. $\begin{bmatrix} 6 & 6 & 6 \\ -5 & -5 & -5 \\ 6 & 6 & 6 \end{bmatrix}$
- d. $\begin{bmatrix} 6 & 0 & 0 \\ 5 & 0 & 0 \\ 6 & 0 & 0 \end{bmatrix} < spanstyle =" \ font - size : 0.9375rem; ">$ ✖

Your answer is incorrect.

The correct answer is:
$\begin{bmatrix} 6 & 5 & 6 \\ 6 & 5 & 6 \\ 6 & 5 & 6 \end{bmatrix}$

Question **7**

Partially correct

Mark 0.33 out of 1.00

A linear transformation $T : \mathbb{R}^2 \longrightarrow \mathbb{R}^2$ first reflects points through the Y-axis(vertical axis) and then reflects points through the X-axis(horizontal axis). Then T is

- [ ] a. neither one-to-one nor onto
- [ ] b. bijective
- [x] c. one-to-one ✔
- [ ] d. onto

Your answer is partially correct.

You have correctly selected 1.
The correct answers are:
one-to-one,

onto,

bijective

Question **8**

Incorrect

Mark 0.00 out of 1.00

Let i be the last digit of your student id (eg. student with id 201851002, i=2).

Consider following linear system

$x_1 + 3x_3 = 3$

$2x_1 + x_2 + 6x_3 = 2$

$x_1 + ix_3 = i$

Choose correct statements

- [ ] a. The linear system is consistent.
- [ ] b. There is no solution to the system.
- [x] c. Existence of solution depends on i. ✖
- [ ] d. The linear system has infinitely many solutions.

Your answer is incorrect.

The correct answers are:
The linear system is consistent.,

The linear system has infinitely many solutions.

Question **9**

Incorrect

Mark 0.00 out of 1.00

Suppose $\{u, v, w\} \subseteq \mathbb{R}^3$ is a linearly independent set and $A = [u\ v\ w\ 0]$ (columns of A are u, v, w and zero vector). Then the linear transformation T whose standard matrix is A is

- [x] a. One-to-one ✖
- [ ] b. neither one-to-one nor onto
- [ ] c. Onto
- [ ] d. bijective

Your answer is incorrect.

The correct answer is:
Onto

Question **10**

Incorrect

Mark 0.00 out of 1.00

Let $AX = b$ be a linear system with dimension of $A = m \times n$ with $m < n$. Then

- a. it never has a solution.
- b. solution may not exists
- c. it has infinitely many solutions ✖

Your answer is incorrect.

The correct answer is:
solution may not exists

Question **11**

Incorrect

Mark 0.00 out of 1.00

Rank of the matrix $A = \begin{bmatrix} 1 & 3 & 0 & 3 \\ -1 & -1 & -1 & 1 \\ 0 & -4 & 2 & -8 \\ 2 & 0 & 3 & -1 \end{bmatrix}$. Then rank of A is equal to

- a. 3
- b. 4 ✖
- c. 2
- d. 1
- e. 0

Your answer is incorrect.

The correct answer is:
3

Question **12**

Incorrect

Mark 0.00 out of 1.00

Choose correct sentences

- [x] a. Row echelon form of a matrix is always unique. ✖
- [ ] b. If no. of variables is less than no. of equations of a consistent linear system then it has infinitely many solutions.
- [ ] c. If one row in a row echelon form of an augmented matrix is [0 0 0 0 0], then the associated linear system has infinitely many solutions.
- [ ] d. If one row in a row echelon form of an augmented matrix is [0 0 0 0 5], then the associated linear system does not have solution.
- [x] e. Elementary column operations on augmented matrix does not affect solution space of a linear system. ✖

Your answer is incorrect.

The correct answers are:
If one row in a row echelon form of an augmented matrix is [0 0 0 0 5], then the associated linear system does not have solution. ,

If no. of variables is less than no. of equations of a consistent linear system then it has infinitely many solutions.

Question **13**

Incorrect

Mark 0.00 out of 1.00

If a linear transformation $T : \mathbb{R}^3 \longrightarrow \mathbb{R}^5$ is one-to-one with standard matrix A, then A has

- ○ a. The rank is three and the nullity is zero.
- ○ b. we can not say anything about rank and nullity.
- ○ c. The rank is five and the nullity is two.
- ◉ d. The rank is two and the nullity is three. ✖

Your answer is incorrect.

The correct answer is:
The rank is three and the nullity is zero.

Question **14**

Correct

Mark 1.00 out of 1.00

Rank of a non-zero matrix of size 10×1 is

a. 1

b. 0

c. 10

Your answer is correct.

The correct answer is:
1

Question **15**

Correct

Mark 1.00 out of 1.00

Basis for Col(A), where A is the following matrix \left[\begin{array}{ccc} 6& 2 & 1\\ 3& 4 & 3\\ 0 & 0 & 1 \end{array} \right]

a. \{\left[\begin{array}{c} 6\\3\\ 0 \end{array}\right],\left[\begin{array}{c} 2\\4\\ 0 \end{array}\right], \left[\begin{array}{c} 1\\3\\ 1 \end{array}\right]\}
.

b. \{\left[\begin{array}{c} 6\\3\\ 0 \end{array}\right]\}

c. \{\left[\begin{array}{c} 6\\3\\ 0 \end{array}\right], \left[\begin{array}{c} 1\\3\\ 1 \end{array}\right]\}

Your answer is correct.

The correct answer is:

\{\left[\begin{array}{c} 6\\3\\ 0 \end{array}\right],\left[\begin{array}{c} 2\\4\\ 0 \end{array}\right], \left[\begin{array}{c} 1\\3\\ 1 \end{array}\right]\}
.

Question **16**

Incorrect

Mark 0.00 out of 1.00

For a matrix $P=\left[\begin{array}{cc} A&C\\ B & D \end{array} \right]$, where A, D are square matrices, choose correct options

- [ ] a. $det(P)=det(A-CD^{-1}B)det(D)$
- [ ] b. If det(A) and det(D) are non-zero and $C=0$ then P is invertible.
- [ ] c. $det(P)=det(A-BD^{-1}C)det(D)$
- [x] d. If det(A) and det(D) are non-zero then P is invertible. ✖

Your answer is incorrect.

The correct answers are: $det(P)=det(A-CD^{-1}B)det(D)$,
If det(A) and det(D) are non-zero and $C=0$ then P is invertible.

Question **17**

Correct

Mark 1.00 out of 1.00

Let $A=\left[\begin{array}{cccc} 1&0&0&1\\ 0&2&3&4\\0&0&5&1\\2&0&0&1 \end{array}\right]$. Then det(A)=

- ( ) a. 4
- ( ) b. 0
- (•) c. -10 ✔
- ( ) d. 10

Your answer is correct.

The correct answer is:
-10

Question **18**

Correct

Mark 1.00 out of 1.00

If $W_1=\{\left[\begin{array}{c} x_1\\x_2\\x_3 \end{array}\right] \in \mathbb{R}^3\ | 6x_1+5x_2+6x_3=0 \}$ and $W_2=\{\left[\begin{array}{c} x_1\\x_2\\x_3 \end{array}\right] \in \mathbb{R}^3\ | x_1=0 \text{ and } 5x_2+6x_3=0 \}$ are subspaces then $W_1 \displaystyle \cup W_2$ is a subspace.

Select one:

(•) True ✔

( ) False

The correct answer is 'True'.

Question **19**

Correct

Mark 1.00 out of 1.00

W=\{\left[\begin{array}{c} a\\b\\ c \end{array}\right] | a,b,c \in \mathbb{Z}\} is a subspace of \mathbb{R}^3

Select one:

- True
- False ✔

The correct answer is 'False'.

Question **20**

Incorrect

Mark 0.00 out of 1.00

Let u=\left[\begin{array}{c} 2\\3\\ -5 \end{array}\right], v=\left[\begin{array}{c} -4\\-5\\ 8 \end{array}\right] and w=\left[\begin{array}{c} 4\\7\\ -12 \end{array}\right]. w is in the subspace generated by u and v.

Select one:

- True
- False ✖

The correct answer is 'True'.

Question **21**

Incorrect

Mark 0.00 out of 1.00

Let j be the last digit of your student id modulo 5 and u=\left[\begin{array}{c} j\\j\\j \end{array} \right], v=\left[\begin{array}{c} 1\\1 \\0 \end{array} \right]. Then \{ u, v\} is linearly independent set.

Select one:

- True
- False ✖

The correct answer is 'True'.

Question **22**

Correct

Mark 1.00 out of 1.00

Let $A=[a_{ij}]_{2\times 2}, a_{ij}=i+j$. Then A is row equivalent to identity matrix.

Select one:

- True ✔
- False

The correct answer is 'True'.

Question **23**

Incorrect

Mark 0.00 out of 1.00

Let i be the last digit of your student id. Suppose we choose a set of $i+1$ vectors in $\mathbb{R}^{i+2}$ then it is always linearly independent.

Select one:

- True ✖
- False

The correct answer is 'False'.

Question **24**

Incorrect

Mark 0.00 out of 1.00

Choose correct statements from below

- a. For a matrix $A_{m\times n},~ Col(A)$ is a subspace of $\mathbb{R}^n$ ✖
- b. Let $T:\mathbb{R}^2 \to \mathbb{R}^3$ be one to one linear transformation then image of line under T is a line in $\mathbb{R}^3.$
- c. Homogeneous system is always consistent.
- d. For a matrix $A_{m\times n}, m< n$ with $Row(A)=\mathbb{R}^n$ implies that $AX=b$ is consistent for any vector b.

Your answer is incorrect.

The correct answers are:
Homogeneous system is always consistent.,

Let $T:\mathbb{R}^2 \to \mathbb{R}^3$ be one to one linear transformation then image of line under T is a line in $\mathbb{R}^3.$

Question **25**

Incorrect

Mark 0.00 out of 1.00

Every elementary row operation is reversible.

- a. False
- b. True
- c. depends on row operation.

Your answer is incorrect.

The correct answer is:
True

Question **26**

Correct

Mark 1.00 out of 1.00

What can you say about Col(B) when B is a 5x4 matrix with linearly independent columns?

- a. Col(B) is a proper subspace of \mathbb{R}^5.
- b. Col(B)=\mathbb{R}^5.
- c. Col(B) is isomorphic to \mathbb{R}^4.
- d. Col(B)=\{0 \}.

Your answer is correct.

The correct answers are:

Col(B) is a proper subspace of \mathbb{R}^5.

,

Col(B) is isomorphic to \mathbb{R}^4.

Question **27**

Correct

Mark 1.00 out of 1.00

What is the rank of A=\left[\begin{array}{ccc} 1& 2 & 3\\ 0 & 1& 3\\ 0& 2 &5 \end{array} \right]

Answer: 3

The correct answer is: 3

Question **28**

Incorrect

Mark 0.00 out of 1.00

Let A=\left[\begin{array}{cccc} 1&3&0&3\\ -1&-1&-1&1\\0&-4&2&-8\end{array}\right]. For which values of b, AX=b has a solution? Choose most correct option.

- a. For all b which are linear combination of first and third column.
- b. Ax=b has a solution if b=\left[\begin{array}{c} 4\\ -2 \\4 \end{array}\right]
- c. For all b which are linear combination of first and second column.
- d. for all b\in \mathbb{R}^3

Your answer is incorrect.

The correct answer is:
For all b which are linear combination of first and second column.

Question **29**

Incorrect

Mark 0.00 out of 1.00

If a set contains fewer vectors than there are entries in the vectors, then the set is linearly independent.

Select one:

- True
- False

The correct answer is 'False'.

Question **30**

Correct

Mark 1.00 out of 1.00

If A and B are square matrices of size n\times n, then which of the following statements are not true?

- [x] a. det (kA) =k^n det (A) ✖
- [ ] b. det(AB)=det(A) det (B)
- [ ] c. det (A^T) =1/det(A^{-1})
- [x] d. det (A + B) = det (A) + det (B) ✔

Your answer is correct.

The correct answer is:
det (A + B) = det (A) + det (B)

◄ Quiz 2_01012021

Jump to...

Midsem 2 (online 10%) ►

Indian Institute of Information Technology Vadodara
End-semester Examination-Autumn 2020-21
MA101: Matrices and Linear Algebra

March 23, 2021

Maximum Marks: 30 Time: 60 minutes

- Start new question on new page.
- Write down name, id and sign on each page of your answersheet.
- Each question carries 5 marks.

1. Find the inverse of following matrix using Gaussian elimination, if it exists. If no then give reason. $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 0 & -1 \\ 0 & 1 & 3 \end{bmatrix}$

2. Find all real solutions of following linear system using LU decomposition. What can you say about no of solutions of a linear system with no. of equations= no. of variables using LU decomposition.
   $x + 2y + 4z = 1$
   $3x + 8y + 14z = 2$
   $2x + 6y + 13z = 3$

3. Give an example of an inner product $<,>$ on $\mathbb{R}^3$ which is different from standard inner product. Prove that it satisfies all properties of an inner product. What is the $< u, u >$, where $u = \begin{bmatrix} i \\ 0 \\ 1 \end{bmatrix}$ and i is the last digit of your id modulo 2.

4. Find the minimal polynomial of following matrix
$$A = \begin{bmatrix} 5 & -6 & -6 \\ -1 & 4 & 2 \\ 3 & -6 & -4 \end{bmatrix}$$
   What can you say about diagonalizability of A?

5. Find SVD decomposition ($A = U\Sigma V^T$) of the following matrix A. What is the relation between U and V?
$$A = \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$$
   What do you observe with SVD decomposition of A? Can you generalize the observation?

6. Describe Power Method and QR algorithm for calculating eigenvectors and eigenvalues. What are the conditions required for convergence of each method? What are the differences between two?

7. Let $v = \begin{bmatrix} 1 \\ 1 \\ i \end{bmatrix}$ where i is the last digit of your student id. Define a linear transformation $T : \mathbb{R}^3 \to \mathbb{R}^3$ such that $T(v) = 0$ and $v \in T(\mathbb{R}^3)$, image of T.

Started on	Friday, 1 January 2021, 2:30 PM
State	Finished
Completed on	Friday, 1 January 2021, 2:45 PM
Time taken	14 mins 52 secs
Grade	**7.00** out of 10.00 (**70**%)

Question **1**

Incorrect

Mark 0.00 out of 1.00

Let $A = \begin{pmatrix} 0 & -2 \\ 2 & 0 \end{pmatrix}$. Which of the following is the correct geometric interpretation of the associated linear transformation?

a. rotates clockwise through 90 degrees and doubles the length.

b. rotates counterclockwise through 90 degrees and halves the length. ✖

c. rotates counterclockwise through 90 degrees and doubles the length.

d. rotates clockwise through 90 degrees and halves the length.

The correct answer is:

rotates counterclockwise through 90 degrees and doubles the length.

Question **2**

Correct

Mark 1.00 out of 1.00

Which of the following sets of vector span $\mathbb{R}^3$?

- [ ] a. $\{\begin{bmatrix}1\\2\\0\end{bmatrix},\begin{bmatrix}0\\-1\\1\end{bmatrix}\}$

- [ ] b. $\{\begin{bmatrix}-1\\2\\3\end{bmatrix},\begin{bmatrix}2\\1\\-1\end{bmatrix},\begin{bmatrix}4\\7\\3\end{bmatrix}\}.$

- [x] c. $\{\begin{bmatrix}1\\0\\2\end{bmatrix},\begin{bmatrix}0\\1\\0\end{bmatrix},\begin{bmatrix}-1\\3\\0\end{bmatrix},\begin{bmatrix}1\\-4\\1\end{bmatrix}\}.$ ✔

- [x] d. $\{\begin{bmatrix}1\\1\\0\end{bmatrix},\begin{bmatrix}0\\1\\-2\end{bmatrix},\begin{bmatrix}1\\3\\1\end{bmatrix}\}.$ ✔

The correct answers are:

$$\{\begin{bmatrix}1\\1\\0\end{bmatrix},\begin{bmatrix}0\\1\\-2\end{bmatrix},\begin{bmatrix}1\\3\\1\end{bmatrix}\}.$$

,

$$\{\begin{bmatrix}1\\0\\2\end{bmatrix},\begin{bmatrix}0\\1\\0\end{bmatrix},\begin{bmatrix}-1\\3\\0\end{bmatrix},\begin{bmatrix}1\\-4\\1\end{bmatrix}\}.$$

Question **3**

Correct

Mark 1.00 out of 1.00

Let $T : \mathbb{R}^2 \longrightarrow \mathbb{R}^2$ be a linear transformation given by

$T(\begin{bmatrix} 1 \\ 1 \end{bmatrix}) = \begin{bmatrix} -3 \\ -3 \end{bmatrix}, T(\begin{bmatrix} 2 \\ 1 \end{bmatrix}) = \begin{bmatrix} 4 \\ 2 \end{bmatrix}$.

Find $T(\begin{bmatrix} 4 \\ 3 \end{bmatrix})$

- a. $\begin{bmatrix} 2 \\ 4 \end{bmatrix}$
- b. $\begin{bmatrix} 0 \\ -4 \end{bmatrix}$
- c. $\begin{bmatrix} -2 \\ 0 \end{bmatrix}$
- d. $\begin{bmatrix} -2 \\ -4 \end{bmatrix}$ ✔

The correct answer is: $\begin{bmatrix} -2 \\ -4 \end{bmatrix}$

Question **4**

Correct

Mark 1.00 out of 1.00

The set $\{u, v\} \subseteq \mathbb{R}^2$ is linearly independent if and only if $\{u + v, u - v\}$ is linearly independent.

Select one:

- True ✔
- False

The correct answer is 'True'.

Question **5**

Incorrect

Mark 0.00 out of 1.00

A set of three vectors is linearly dependent only if one of them is a scalar multiple of another.

Select one:

- (selected) True ✖
- False

The correct answer is 'False'.

Question **6**

Correct

Mark 1.00 out of 1.00

If $\{v_1, v_2, v_3, v_4\}$ are in $\mathbb{R}^4$ and v_4 is not a linear combination of $\{v_1, v_2, v_3\}$, then $\{v_1, v_2, v_3, v_4\}$ must be linearly independent.

Select one:

- True
- (selected) False ✔

The correct answer is 'False'.

Question **7**

Incorrect

Mark 0.00 out of 1.00

A finite set of vectors is linearly independent iff its every proper finite subset is linearly independent.

Select one:

- (selected) True ✖
- False

The correct answer is 'False'.

Question **8**

Correct

Mark 1.00 out of 1.00

Let A, b be given. Then $AX = b$ has infinitely many solutions if and only if $AX = 0$ has infinitely many solutions.

Select one:

- ○ True
- ◉ False ✔

The correct answer is 'False'.

Question **9**

Correct

Mark 1.00 out of 1.00

$T : \mathbb{R}^2 \longrightarrow \mathbb{R}^2$ defined by $T(\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}) = \begin{bmatrix} x_1 + x_2 \\ x_1 - x_2 + 1 \end{bmatrix}$ is a linear transformation.

Select one:

- ○ True
- ◉ False ✔

The correct answer is 'False'.

Question **10**

Correct

Mark 1.00 out of 1.00

Let $T : \mathbb{R}^3 \longrightarrow \mathbb{R}^3$ be the function that sends $T \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} x_3 + x_1 \\ x_1 . x_2 \\ 3x_3 \end{bmatrix}$. Is T a linear transformation?

Select one:

- ○ True
- ◉ False ✔

The correct answer is 'False'.

◄ Announcements

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