TELANGANA RESIDENTIAL EDUCATIONAL INSTITUTIONS RECRUITMENT BOARD TREI-RB

Notations :

1.Options shown in green color and with ✔ icon are correct.

2.Options shown in red color and with ✖ icon are incorrect.

Question Paper Name :	Mathematics 18thAug 2023 Shift 2
Subject Name :	Mathematics
Creation Date :	2023-08-18 15:20:45
Duration :	120
Total Marks :	100
Display Marks:	Yes
Calculator :	None
Magnifying Glass Required? :	No
Ruler Required? :	No
Eraser Required? :	No
Scratch Pad Required? :	No
Rough Sketch/Notepad Required? :	No
Protractor Required? :	No
Show Watermark on Console? :	Yes
Highlighter :	No
Auto Save on Console?	Yes
Change Font Color :	No
Change Background Color :	No
Change Theme :	No
Help Button :	No
Show Reports :	No
Show Progress Bar :	No

Mathematics

Group Number :	1
Group Id :	594253111
Group Maximum Duration :	0
Group Minimum Duration :	120
Show Attended Group? :	No
Edit Attended Group? :	No
Break time :	0
Group Marks :	100

Is this Group for Examiner? :	No
Examiner permission :	Cant View
Show Progress Bar? :	No

Mathematics

Section Id :	594253127
Section Number :	1
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	100
Number of Questions to be attempted :	100
Section Marks :	100
Enable Mark as Answered Mark for Review and Clear Response :	Yes
Maximum Instruction Time :	0
Sub-Section Number :	1
Sub-Section Id :	594253165
Question Shuffling Allowed :	Yes
Is Section Default? :	null

Question Number : 1 Question Id : 59425311030 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

If a and b are natural numbers such that $5^{a-5} - 5^{b-5} = 624$, then

Options :

1. ✖ $a = 10,\ b = 6$

2. ✔ $b = 5$ but a cannot be determined

3. ✖ $a = 9,\ b = 5$

4. ✖ the information is not enough for a and b to be determined

Question Number : 2 Question Id : 59425311031 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

The number of elements in the ring of integers modulo 15 whose square is 1 is

Options :

1. ✖ 4

2. ✖ 3

3. ✖ 2

4. ✔ 1

Question Number : 3 Question Id : 59425311032 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

The value of $67^{803} (\text{mod } 15)$ is

Options :

1. ✔ $\overline{2}$

2. ✖ $\overline{5}$

3. ✖ $\overline{4}$

4. ✖ $\overline{13}$

Question Number : 4 Question Id : 59425311033 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

$$\sum_{d|120} \phi(d) - 120 =$$

Options :

1. ✖ 0

2. ✔ 3

3. ✖ 5

4. ✖ 10

Question Number : 5 Question Id : 59425311034 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

If p is an odd prime and

$(X-1)(X-2).....(X-(p-1)) = X^{p-1} + a_1X^{p-2} + a_2X^{p-3} + ... + a_{p-1},$

then $a_{p-1} =$

Options :

1. ✖ $1(\text{mod } p)$

2. ✖ $0(\text{mod } p)$

3. ✖ $2(\text{mod } p)$

4. ✔ $-1(\text{mod } p)$

Question Number : 6 Question Id : 59425311035 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

Suppose a and b are natural numbers and u, v integers such that $au + bv = 1$. Then a solution of the congruence $aX \equiv t(\text{mod } b)$ is

Options :

1. ✖ $X = uv$

2. ✖ $X = ut$

3. ✔ $X = vt$

4. ✖ $X = uvt$

Question Number : 7 Question Id : 59425311036 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

The number of integers which are simultaneously congruent to $1(\text{mod } 3)$, $2(\text{mod } 5)$, $3(\text{mod } 7)$ and $4(\text{mod } 11)$ and which lie between 0 and 2310 are

Options :

1. ✖ 0

2. ✖ 1

3. ✔ 2

4. ✖ 3

Question Number : 8 Question Id : 59425311037 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

Which of the following statements is **FALSE**?

Options :

1. ✖ Every group of order 55 is cyclic

2. ✔ Every group of order 33 is cyclic

3. ✖ Every group of order 51 is cyclic

4. ✖ Every group of order 35 is cyclic

Question Number : 9 Question Id : 59425311038 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

The number of Sylow 5 subgroups in the permutation group S_5 is

Options :

1. ✖ 7

2. ✖ only one

3. ✖ 5

4. ✔ 6

Question Number : 10 Question Id : 59425311039 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

The maximum possible order of an element in S_{10} is

Options :

1. ✖ 10!

2. ✖ 30

3. ✖ 21

4. ✔ 14

Question Number : 11 Question Id : 59425311040 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

The number of possible homomorphisms from a cyclic group of order 8 to a cyclic group of order 6 is

Options :

1. ✖ 1

2. ✖ 2

3. ✖ 3

4. ✔ 4

Question Number : 12 Question Id : 59425311041 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

Which of the following statements is TRUE?

Options :

1. ✔ The direct product of two cyclic groups must be cyclic

2. ✖ A group of order pq, where p, q are distinct primes, must have a normal Sylow subgroup

3. ✖ A dihedral group of order 10 must be simple

4. ✖ $(\mathbb{R}, +)$ is isomorphic to $(\mathbb{R} \setminus \{0\}, .)$

Question Number : 13 Question Id : 59425311042 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

If y is an element in a group and the order of y is 5 and $x \neq e$ is an element in the group such that $yxy^{-1} = x^2$, then the order of x must be

Options :

1. ✖ 8

2. ✖ 16

3. ✖ 25

4. ✔ 31

Question Number : 14 Question Id : 59425311043 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

The number of possible homomorphisms from a dihedral group of order 42 to a group of order 25 is

Options :

1. ✖ 1 only

2. ✖ 3

3. ✖ 5

4. ✔ 7

Question Number : 15 Question Id : 59425311044 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

In the alernating group A_4, the number of subgroups of order 6 is

Options :

1. ✖ 1

2. ✖ 0

3. ✔ 2

4. ✖ 3

Question Number : 16 Question Id : 59425311045 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

The number of conjugacy classes in the permutation group S_5 is

Options :

1. ✖ 6

2. ✔ 8

3. ✖ 10

4. ✖ 7

Question Number : 17 Question Id : 59425311046 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

Which of the following statements is **FALSE**?

Options :

1. ✖ There exists an injective homomorphism from any group of order 6 to S_6

2. ✖ In an abelian group G of order n, if m divides n then there must exist a subgroup of order m

3. ✔ A group of order 28 must have a unique Sylow 7 subgroup

4. ✖ A group of order 21 must be cyclic

Question Number : 18 Question Id : 59425311047 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum

Instruction Time : 0
Correct Marks : 1 Wrong Marks : 0.25

The number of units in the subring $\mathbb{Z} + \mathbb{Z}i = \{a + bi \mid a, b \in \mathbb{Z}\}$ of the complex numbers is

Options :

1. ✖ 1

2. ✖ 2

3. ✔ 3

4. ✖ 4

Question Number : 19 Question Id : 59425311048 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0
Correct Marks : 1 Wrong Marks : 0.25

Consider the statements.
S_1 : The polynomial ring $\mathbb{Z}[X]$ is a principal ideal domain.
S_2 : The polynomial ring $\mathbb{Z}_p[X]$ is a Euclidean domain.
Then

Options :

1. ✖ both S_1 and S_2 are false

2. ✖ S_1 is true but S_2 is false

3. ✔ S_1 is false but S_2 is true

4. ✖ both S_1 and S_2 are true

Question Number : 20 Question Id : 59425311049 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0
Correct Marks : 1 Wrong Marks : 0.25

The number of maximal ideals in the ring $\mathbb{Z}_{900}$ of integers modulo 900 is

Options :

1. ✖ 1

2. ✖ 3

3. ✖ 5

4. ✔ 9

Question Number : 21 Question Id : 59425311050 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

Consider the statements.

S_1 : In a commutative ring with 1 prime ideals and maximal ideals are the same.

S_1 : If P is a prime ideal in a ring R with 1, then R/P is an integral domain.

Then

Options :

1. ✔ both S_1 and S_2 are false

2. ✖ S_1 is true but S_2 is false

3. ✖ S_1 is false but S_2 is true

4. ✖ both S_1 and S_2 are true

Question Number : 22 Question Id : 59425311051 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

Which two of the following four statements are TRUE?

S_1 : The only proper ideal in a field is the zero ideal.

S_2 : In the ring $M_2(\mathbb{Z})$ of 2×2 matrices with integer coefficients the set of matrices of the form $\begin{bmatrix} a & 0 \\ b & 0 \end{bmatrix}$ form a right ideal.

S_3 : All non-zero prime ideals in $\mathbb{Z}$ are also maximal.

S_4 : The ring $C[0,1]$ of continuous real valued functions on [0,1] under pointwise addition and multiplication is a ring without unity.

Options :

1. ✖ S_1 and S_4

2. ✔ S_2 and S_3

3. ✖ S_1 and S_3

4. ✖ S_2 and S_4

Question Number : 23 Question Id : 59425311052 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

In the ring of Gaussian integers $\mathbb{Z} + \mathbb{Z}i$, which of the following statements is **FALSE**?

Options :

1. ✖ Every non-zero prime ideal in the ring is maximal

2. ✖ $1 + i$ generates a prime ideal

3. ✔ 7 generates a prime ideal

4. ✖ $5 + 12i$ generates a prime ideal

Question Number : 24 Question Id : 59425311053 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

In the ring $\mathbb{Z}$ of integers the ideal generated by 39 and 82 is

Options :

1. ✔ $3\mathbb{Z}$

2. ✖ $41\mathbb{Z}$

3. ✖ $\mathbb{Z}$

4. ✖ $13\mathbb{Z}$

Question Number : 25 Question Id : 59425311054 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

An example of a ring which is **NOT** a principal ideal domain is

Options :

1. ✖ $\mathbb{Z}$

2. ✖ $\mathbb{Z}[X]$

3. ✖ $\mathbb{R}[X]$

4. ✔ $\mathbb{Z}_{23}$

Question Number : 26 Question Id : 59425311055 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

In the direct product ring $\mathbb{Q}\times\mathbb{Z}$, which of the following subsets is **NOT** a prime ideal?

Options :

1. ✔ $\mathbb{Q} \times 2\mathbb{Z}$

2. ✖ $\{0\} \times \mathbb{Z}$

3. ✖ $\{0\} \times 5\mathbb{Z}$

4. ✖ $\mathbb{Q} \times 5\mathbb{Z}$

Question Number : 27 Question Id : 59425311056 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

The number of ring homomorphisms from $\mathbb{Z}$ to $\mathbb{Z}_{12}$ is

Options :

1. ✔ 1

2. ✖ 0

3. ✖ 2

4. ✖ 3

Question Number : 28 Question Id : 59425311057 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

What should x be so that the nullity of the matrix

$$\begin{bmatrix} 1 & -2 & 0 \\ -1 & x & 0 \\ 0 & 0 & 1 \end{bmatrix}$$ is 1?

Options :

1. ✖ 0

2. ✔ 1

3. ✖ 2

4. ✖ -2

Question Number : 29 Question Id : 59425311058 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

In $\mathbb{R}^3$, which of the following vectors is not in the space spanned by the vectors (1,0,0) and (1,1,1)?

Options :

1. ✔ (3,2,2)

2. ✖ (2,2.5,2.5)

3. ✖ (1,1,0)

4. ✖ (5,7,7)

Question Number : 30 Question Id : 59425311059 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

The rank and nullity of the matrix $\begin{bmatrix} 1 & 1 & 1 & 1 \\ 2 & 2 & 2 & 2 \\ 3 & 3 & 3 & 3 \\ 4 & 4 & 4 & 4 \end{bmatrix}$ are respectively

Options :

1. ✖ 1 and 2

2. ✖ 1 and 3

3. ✖ 2 and 2

4. ✔ 3 and 1

Question Number : 31 Question Id : 59425311060 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

The index and signature of the quadratic form

$-7X_1^2 + 3X_2^2 - 4X_3^2 + 5X_4^2 + 6X_5^2$

are respectively

Options :

1. ✔ 1 and 3

2. ✖ 90 and 28

3. ✖ -28 and 90

4. ✖ 3 and 1

Question Number : 32 Question Id : 59425311061 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

In $\mathbb{R}^5$, the dimension of the subspace generated by the vectors

$e_1 + e_2, e_2 + e_3, e_3 + e_4, e_4 + e_5$ (e_i is the vector with 1 in the ith place and zeroes everywhere else) is

Options :

1. ✖ 1

2. ✖ 2

3. ✔ 3

4. ✖ 4

Question Number : 33 Question Id : 59425311062 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

The characteristic polynomial of the matrix $\begin{bmatrix} 1 & i \\ 1 & -i \end{bmatrix}$ is

Options :

1. ✖ $X^2 - (1-i)X - 2i$

2. ✔ $X^2 + (1-i)X + 2i$

3. ✖ $X^2 - (1-i)X + 2i$

4. ✖ $X^2 + (1-i)X - 2i$

Question Number : 34 Question Id : 59425311063 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

Consider the statements.

S_1 : If the characteristic polynomial of a $n \times n$ complex matrix is of degree 7, then $n = 7$.

S_2 : If an $n \times n$ complex matrix has four distinct eigenvalues then $n = 4$.

Then

Options :

1. ✔ both S_1 and S_2 must be false

2. ✖ S_1 is true but S_2 is false

3. ✖ S_1 is false but S_2 is true

4. ✖ both S_1 and S_2 are true

Question Number : 35 Question Id : 59425311064 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

If a 3×3 matrix M has eigenvalues $1,1,-2$, then the trace of M^5 is

Options :

1. ✖ 0

2. ✖ 6

3. ✖ -30

4. ✔ 32

Question Number : 36 Question Id : 59425311065 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

The quadratic form given by $X_1^2 + 2X_1X_2 + X_3^2$ is

Options :

1. ✖ positive definite

2. ✔ negative definite

3. ✖ positive semi-definite

4. ✖ indefinite

Question Number : 37 Question Id : 59425311066 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum

Instruction Time : 0
Correct Marks : 1 Wrong Marks : 0.25

In $\mathbb{R}^3$, let $v_1 = (1, 2, -1), v_2 = (-1, 3, 1)$. Then which one of the following vectors v_3 is such that $\{v_1, v_2, v_3\}$ is a basis of $\mathbb{R}^3$?

Options :

1. ✖ $(2, 79, -2)$

2. ✖ (0,30,0)

3. ✖ $(-2, -1, 2)$

4. ✔ (3,17,3)

Question Number : 38 Question Id : 59425311067 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0
Correct Marks : 1 Wrong Marks : 0.25

Let $A = \begin{bmatrix} \overline{4} & \overline{2} \\ \overline{1} & \overline{3} \end{bmatrix} \in M_2(\mathbb{Z}_7)$, where $\mathbb{Z}_7$ is the field of 7 elements. Then the additive and multiplicative orders of A are respectively

Options :

1. ✖ 3 and 4

2. ✖ 7 and 4

3. ✖ 4 and 7

4. ✔ 7 and 6

Question Number : 39 Question Id : 59425311068 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0
Correct Marks : 1 Wrong Marks : 0.25

Which of the following statements is true about complex $n \times n$ matrices?

Options :

1. ✖ All non-singular matrices are diagonalizable

2. ✔ A matrix is diagonalizable if and only if its eigenvalues are distinct

3. ✖ A matrix is diagonalizable if it has n distinct eigenvalues

4. ✖ A matrix is diagonalizable if it has a single eigenvalue

Question Number : 40 Question Id : 59425311069 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

If $T : \mathbb{R}^3 \to \mathbb{R}^3$ is given by $T((a,b,c)) = (a-b+c, a+b-c, -a+b+c)$, $a,b,c \in \mathbb{R}$. Then the rank and nullity of T are respectively

Options :

1. ✖ 2 and 1

2. ✖ 1 and 2

3. ✔ 0 and 3

4. ✖ 3 and 0

Question Number : 41 Question Id : 59425311070 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

Let M_3 denote the vector space of all 3×3 matrices with complex entries over the field $\mathbb{R}$ and $V = \{A \in M_3 |\ A \text{ is a skew-Hermitian matrix}\}$. Then the dimension of $\frac{M_3}{V}$ over the field $\mathbb{R}$ is

Options :

1. ✖ 6

2. ✖ 3

3. ✖ 9

4. ✔ 12

Question Number : 42 Question Id : 59425311071 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

Which of the following is a finite dimensional vector space?

Options :

1. ✔ vector space $\mathbb{R}$ over $\mathbb{Q}$

2. ✖ vector space $\mathbb{C}$ over $\mathbb{Q}$

3. ✖ vector space $\mathbb{C}$ over $\mathbb{R}$

4. ✖ vector space V_2 over $\mathbb{R}$, where $V_2 = \{f : (0,1) \to \mathbb{R} | \ f \text{ is twice differentiable}\}$

Question Number : 43 Question Id : 59425311072 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

Consider the vector space $\mathbb{R}^5$ over the field $\mathbb{R}$. Let $|A|$ denote the number of elements in the set A. Then, which of the following statements is **FALSE**?

Options :

1. ✖ There exists a linearly independent set $A \subset \mathbb{R}^5$ with $|A| = 3$

2. ✖ There exists $A \subset \mathbb{R}^5$ such that $|A| = 3$ and A spans $\mathbb{R}^5$

3. ✖ There exists $A \subset \mathbb{R}^5$ such that $|A| = 10$ and A spans $\mathbb{R}^5$

4. ✔ If $A \subset \mathbb{R}^5$, $|A| = 10$, the A is linearly dependent

Question Number : 44 Question Id : 59425311073 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

Let $(V, <, >)$ be a finite dimensional inner product space. Consider the following statements.

S_1 : If $x_i \perp x_j, \forall 1 \leq i, j \leq n, i \neq j$, then $\| \sum_{i=1}^{n} x_i \|^2 = \sum_{i=1}^{n} \|x_i\|^2$

S_2 : If V^* denotes the dual of V, then V is isomorphic to V^*.

Then

Options :

1. ✖ S_1 is true, S_2 is false

2. ✖ S_2 is true, S_1 is false

3. ✔ S_1 is true, S_2 is true

4. ✖ S_1 is false, S_2 is false

Question Number : 45 Question Id : 59425311074 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

Which of the following norms on $\mathbb{R}^n$ is given by an inner product?

Options :

1. ✖ $\|\bar{x}\| = \sum_{i=1}^{n} |x_i|, \forall \bar{x} = (x_1, x_2, .., x_n) \in \mathbb{R}^n$

2. ✔ $\|\bar{x}\| = \max_{1 \le i \le n} |x_i|, \forall \bar{x} = (x_1, x_2, .., x_n) \in \mathbb{R}^n$

3. ✖ $\|\bar{x}\| = (\sum_{i=1}^{n} |x_i|^2)^{\frac{1}{2}}, \forall \bar{x} = (x_1, x_2, .., x_n) \in \mathbb{R}^n$

4. ✖ $\|\bar{x}\| = (\sum_{i=1}^{n} |x_i|^3)^{\frac{1}{3}}, \forall \bar{x} = (x_1, x_2, .., x_n) \in \mathbb{R}^n$

Question Number : 46 Question Id : 59425311075 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

Let $(V, <, >)$ be a finite dimensional inner product space. Consider

S_1 : For every proper subspace W of V, $\exists$ a unit vector $\bar{v} \in V$ such that $\bar{v} \in W^{\perp}$.

S_2 : Let W_1, W_2 be two subspaces of V. Then $W_1 \cap W_2 = \{0\}$ if and only if $W_1 \perp W_2$.

Then

Options :

1. ✖ S_1 is true and S_2 is false

2. ✖ S_2 is true and S_1 is false

3. ✖ S_1 is true and S_2 is true

4. ✔ S_1 is false and S_2 is false

Question Number : 47 Question Id : 59425311076 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum

Instruction Time : 0
Correct Marks : 1 Wrong Marks : 0.25

Which of the following is true for sequences in $\mathbb{R}$?

Options :

1. ✖ Every monotonic sequence has a convergent subsequence

2. ✖ Every absolutely convergent sequence is convergent

3. ✔ Every bounded sequence has an absolutely convergent subsequence

4. ✖ Every convergent sequence is monotonic

Question Number : 48 Question Id : 59425311077 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0
Correct Marks : 1 Wrong Marks : 0.25

Which of the following is **FALSE**?

Options :

1. ✔ Sums and products of irrational numbers are always irrational

2. ✖ Every irrational number is the limit of suitable convergent sequence of rational numbers

3. ✖ There are uncountably many irrational numbers between any two distinct rational numbers

4. ✖ There is a sequence (a_n), where each a_n is irrational and $\sum_{n=1}^{\infty} a_n$ is a rational number

Question Number : 49 Question Id : 59425311078 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0
Correct Marks : 1 Wrong Marks : 0.25

Which of the following statements is **FALSE**?

Options :

1. ✖ $\sum_{n=1}^{\infty} \frac{(-1)^n}{n}$ is convergent

2. ✖ $\sum_{n=1}^{\infty} \frac{(-1)^n}{n}$ is absolutely convergent

3. ✔ $\sum_{n=1}^{\infty} \frac{(-1)^n}{n^2}$ is absolutely convergent

4. ✖ $\sum_{n=1}^{\infty} \frac{(-1)^n}{n^{\frac{3}{2}}}$ is convergent

Question Number : 50 Question Id : 59425311079 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

Let $\sum_{n=1}^{\infty} c_n$ be the Cauchy product of $\sum_{n=1}^{\infty} a_n$ and $\sum_{n=1}^{\infty} b_n$. Assume that $\sum_{n=1}^{\infty} b_n$ converges. Then which of the following is **FALSE**?

Options :

1. ✖ If $\sum_{n=1}^{\infty} a_n$ converges absolutely, then $\sum_{n=1}^{\infty} a_n^2$ converges

2. ✖ If $\sum_{n=1}^{\infty} a_n$ converges absolutely, then $\left(\sum_{n=1}^{\infty} a_n\right)\left(\sum_{n=1}^{\infty} b_n\right) = \sum_{n=1}^{\infty} c_n$

3. ✖ If both $\sum_{n=1}^{\infty} a_n$, $\sum_{n=1}^{\infty} c_n$ converge, then $\left(\sum_{n=1}^{\infty} a_n\right)\left(\sum_{n=1}^{\infty} b_n\right) = \sum_{n=1}^{\infty} c_n$

4. ✔ If $\sum_{n=1}^{\infty} a_n$ converges, then $\sum_{n=1}^{\infty} c_n$ converges

Question Number : 51 Question Id : 59425311080 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

Which of the following sequences does not converge to e?

Options :

1. ✖ (x_n), where $x_n = \left(1+\frac{1}{n}\right)^n, n \in \mathbb{N}$

2. ✔ (x_n), where $x_n = \left(1-\frac{1}{n}\right)^n, n \in \mathbb{N}$

3. ✖ (x_n), where $x_n = \sum_{k=0}^{2n} \frac{1}{k!}, n \in \mathbb{N}$

4. ✖ (x_n), where $x_n = \left(1+\frac{1}{2n+1}\right)^{2n}, n \in \mathbb{N}$

Question Number : 52 Question Id : 59425311081 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

$\lim_{n\to\infty} \sqrt{n}\left(\sqrt{n+1}-\sqrt{n}\right) =$

Options :

1. ✔ 1

2. ✖ $\frac{1}{2}$

3. ✖ 0

4. ✖ ∞

Question Number : 53 Question Id : 59425311082 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

The function $f : \mathbb{R} \to \mathbb{R}$, $f(x) = e^x$, $x \in \mathbb{R}$, is

Options :

1. ✔ one - one

2. ✖ onto

3. ✖ one - one and onto

4. ✖ neither one - one nor onto

Question Number : 54 Question Id : 59425311083 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

Let $f : \mathbb{R} \to \mathbb{R}$ be a continuous function, $a, b \in \mathbb{R}$, and $a < b$. Then the set $f([a, b])$ is of the form

Options :

1. ✖ (c, d), for some $c, d \in \mathbb{R}$

2. ✖ $\bigcup_{i \in \mathbb{N}} (c_i, d_i)$, for some $c_i, d_i \in \mathbb{R}$, $i \in \mathbb{N}$

3. ✖ $[c, d]$, for some $c, d \in \mathbb{R}$

4. ✔ $\bigcup_{i\in\mathbb{N}}[c_i, d_i]$, for some $c_i, d_i \in \mathbb{R}, i \in \mathbb{N}$

Question Number : 55 Question Id : 59425311084 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

Let $f : [1, \infty) \to \mathbb{R}$ be a continuous function. Which of the following statements is true?

Options :

1. ✔ If f is bounded, then f is uniformly continuous

2. ✖ If f is unbounded, then f is NOT uniformly continuous

3. ✖ If $\lim_{x\to\infty} f(x)$ exists in $\mathbb{R}$, then f is uniformly continuous

4. ✖ If f is monotonic, then f is uniformly continuous

Question Number : 56 Question Id : 59425311085 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

Consider $f : \mathbb{R} \to [-1, 1]$, given by $f(x) = \sin x$. Which of the following statements need **NOT** be true?

Options :

1. ✖ If D is dense in $\mathbb{R}$, then $f(D)$ is dense in $[-1, 1]$

2. ✖ If A is closed in $\mathbb{R}$, then $f(A)$ is closed in $[-1, 1]$

3. ✔ If U is open in $[-1, 1]$, then $f^{-1}(U)$ is open in $\mathbb{R}$

4. ✖ If A is closed in $[-1, 1]$, then $f^{-1}(A)$ is closed in $\mathbb{R}$

Question Number : 57 Question Id : 59425311086 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

If $f : (a, b) \to \mathbb{R}$ is a differentiable function, then

Options :

1. ✖ f is uniformly continuous

2. ✖ f can be extended continuously to $[a, b]$

3. ✔ f' is continuous on (a, b)

4. ✖ f' has the intermediate value property

Question Number : 58 Question Id : 59425311087 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

$$\lim_{n\to\infty} \sum_{k=1}^{n} \frac{1}{n+k} =$$

Options :

1. ✖ $\log 2$

2. ✖ $\log 4$

3. ✖ $\log 6$

4. ✔ $\log 8$

Question Number : 59 Question Id : 59425311088 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

$$\lim_{n\to\infty}\sum_{k=1}^{n}\frac{1}{n}e^{\frac{k}{n}}=$$

Options :

1. ✖ e

2. ✔ $e+1$

3. ✖ $e-1$

4. ✖ 0

Question Number : 60 Question Id : 59425311089 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

Which of the following is complete with usual metric?

Options :

1. ✔ $\mathbb{Q}\times(\mathbb{R}\setminus\mathbb{Q})$

2. ✖ $\mathbb{Q}\times\mathbb{C}$

3. ✖ $\mathbb{R}^{2023}$

4. ✖ $\{(x,y)\in\mathbb{R}^2/x^2+y^2<1\}$

Question Number : 61 Question Id : 59425311090 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

For $n \in \mathbb{N}$, consider the metric spaces $(\mathbb{R}^n, d_2)$, $(\mathbb{R}^n, D)$,

where $d_2(x,y) = \sqrt{\sum_{i=1}^{n} |x_i - y_i|^2}$, $D(x,y) = \begin{cases} 1, x \neq y, \\ 0, x = y, \end{cases}$ $\forall x, y \in \mathbb{R}^n$.

Which of the following functions is discontinuous?

Options :

1. ✖ $f : (\mathbb{R}, D) \to (\mathbb{R}, d_2), f(x) = x, \forall x \in \mathbb{R}$

2. ✖ Fix $y \in \mathbb{R}^n, f : (\mathbb{R}^n, d_2) \to (\mathbb{R}, d_2), f(x) = y.x, \forall x \in \mathbb{R}^n$

3. ✔ $f : (\mathbb{R}^n, d_2) \to (\mathbb{R}^n, d_2), f(x) = \begin{cases} x, \text{ if } d_2(0,x) \leq 1, \\ \dfrac{x}{(d_2(0,x))^2}, \text{ if } d_2(0,x) > 1 \end{cases}$

4. ✖ $f : (\mathbb{R}, d_2) \to (\mathbb{R}, D), f(x) = x, \forall x \in \mathbb{R}$

Question Number : 62 Question Id : 59425311091 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

Consider the metric spaces $(C[0,1], d_\infty)$, $(\mathbb{R}, d_2)$, $([1,\infty), d_2)$, where $C[0,1]$ is the set of all real valued continuous functions from $[0,1]$, $d_\infty(f,g) = \sup_{x \in [0,1]} |f(x) - g(x)|, \forall f, g \in C[0,1]$, $d_2(x,y) = |x-y|$, $\forall x, y \in \mathbb{R}$. Consider the functions defined by $T : \mathcal{C}[0,1] \to \mathbb{R}$, $Tf = f(0)$, and $f : [1,\infty] \to \mathbb{R}, f(x) = \dfrac{1}{x^5}$. Then

Options :

1. ✖ both f and T are uniformly continuous

2. ✔ f is uniformly continuous but T is not uniformly continuous

3. ✖ T is uniformly continuous but f is not uniformly continuous

4. ✖ both f and T are not uniformly continuous

Question Number : 63 Question Id : 59425311092 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

Let (X, d) be a compact metric space with infinite number of elements. Which of the following is **NOT** true?

Options :

1. ✖ X is complete

2. ✖ X is closed and bounded

3. ✔ (3) There exists an infinite set $S \subset X$ such that every element in S is isolated

4. ✖ X is totally bounded

Question Number : 64 Question Id : 59425311093 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

Which of the following subsets of $\mathbb{R}^2$ with Euclidean metric is connected?

Options :

1. ✔ $\{(x, y) |\ x \neq 0\}$

2. ✖ $\{(x, y) |\ x \neq 0\} \cup \{(0, 0)\}$

3. ✖ $\{(x, y) |\ (x^2 + y^2 - 1)(x^2 + y^2 - 2) = 0\}$

4. ✖ $\{(x, y) |\ 2x + 3y = \pm 1\}$

Question Number : 65 Question Id : 59425311094 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

Let τ_u be the usual topology on $\mathbb{R}$. Suppose $f : (\mathbb{R}, \tau_u) \to (\mathbb{R}, \tau_u)$, $f(x) = x^2 + e^x$ and $A = f^{-1}((-2, 5])$. Then A is

Options :

1. ✖ closed but not open

2. ✖ open but not closed

3. ✖ neither closed nor open

4. ✔ both closed and open

Question Number : 66 Question Id : 59425311095 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

If $B_1 = \{A \subsetneq \mathbb{R} |\ 0 \in A\}, B_2 = \{A \subset \mathbb{R} |\ 0 \notin A\} \cup \mathbb{R}$, then

Options :

1. ✖ B_1 is a basis of some topology on $\mathbb{R}$ but B_2 is not so

2. ✖ B_2 is a basis of some topology on $\mathbb{R}$ but B_1 is not so

3. ✔ B_1 and B_2 are bases of some topologies on $\mathbb{R}$

4. ✖ neither B_1 nor B_2 is a basis of any topology on $\mathbb{R}$

Question Number : 67 Question Id : 59425311096 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

If τ_1 and τ_2 are topologies with bases B_1, B_2 respectively, where $B_1 = \{(a, b) |\ a < b, a, b \in \mathbb{Q}\}, B_2 = \{(a, b) |\ a < b, a, b \in \mathbb{R}\}$, then

Options :

1. ✖ $\tau_1 \subset \tau_2$

2. ✖ $\tau_2 \subset \tau_1$

3. ✔ $\tau_1 = \tau_2$

4. ✖ τ_1, τ_2 are not comparable

Question Number : 68 Question Id : 59425311097 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

Consider $\mathbb{R}$ with cofinite topology τ. Then $\{l|\ (\frac{1}{n}) \to l \text{ in } (\mathbb{R}, \tau)\} =$

Options :

1. ✖ $\{0\}$

2. ✖ $\left\{\frac{1}{n} |\ n \in \mathbb{N}\right\} \cup \{0\}$

3. ✖ $\mathbb{R}$

4. ✔ $(\mathbb{R} \setminus \{\frac{1}{n} |\ n \in \mathbb{N}\}) \cup \{0\}$

Question Number : 69 Question Id : 59425311098 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

$$\oint_{|z-2|=4} \frac{dz}{z-2} =$$

Options :

1. ✖ $2\pi i$

2. ✔ 1

3. ✖ 4π

4. ✖ i

Question Number : 70 Question Id : 59425311099 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

If $f(x+iy) = x^3 - y^3, \forall x, y \in \mathbb{R}$, then

Options :

1. ✖ f satisfies the Cauchy-Riemann equations in $\mathbb{C}$

2. ✖ f is entire

3. ✔ f is differentiable in $\mathbb{C} \setminus \{0\}$

4. ✖ f is differentiable only at $z = 0$

Question Number : 71 Question Id : 59425311100 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

Consider the following statements.

S_1 : There exists a non-constant entire function f such that $|f(z)| > 10$, $\forall z \in \mathbb{C}$.

S_2 : There exists a non-constant entire function f such that $|f(z)| < 10$, $\forall z \in \mathbb{C}$.

Then

Options :

1. ✖ S_1 is true and S_2 is false

2. ✔ S_2 is true and S_1 is false

3. ✖ S_1 is true and S_2 is true

4. ✖ S_1 is false and S_2 is false

Question Number : 72 Question Id : 59425311101 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

$$\oint_{|z|=\pi} \pi \cot(\pi z) dz =$$

Options :

1. ✖ $14\pi i$

2. ✖ 14π

3. ✖ π^2

4. ✔ $14\pi^2$

Question Number : 73 Question Id : 59425311102 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

The largest region of convergence of $\sum_{n=1}^{\infty} (-1)^{n-1} \frac{z^{2n-1}}{(2n-1)!}$ is

Options :

1. ✖ $\{z/\ |z| < 1\}$

2. ✖ $\{z/\ |z| < 1\} \cup \{x/\ x \in \mathbb{R}\}$

3. ✖ $\{z/\ |z| \leq 1\}$

4. ✔ $\mathbb{C}$

Question Number : 74 Question Id : 59425311103 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

The Laurent series of $\frac{z}{(z-1)(2-z)}$ in $|z| < 1$ is

Options :

1. ✖ $-\frac{1}{2}z - \frac{3}{4}z^2 - \frac{7}{8}z^3 - \ldots$

2. ✖ $-\frac{1}{2}z + \frac{3}{4}z^2 - \frac{7}{8}z^3 - \ldots$

3. ✖ $-\frac{1}{2}z - \frac{3}{4}z^2 + \frac{7}{8}z^3 - \ldots$

4. ✔ $-\frac{1}{2}z + \frac{3}{4}z^2 + \frac{7}{8}z^3 + \ldots$

Question Number : 75 Question Id : 59425311104 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

If the radius of convergence of $\sum_{n=0}^{\infty} a_n z^n$ is $r > 0$, then which of the following series has the same radius of convergence?

Options :

1. ✖ $\sum_{n=0}^{\infty} 3^n a_n z^n$

2. ✖ $\sum_{n=0}^{\infty} z^n$

3. ✖ $\sum_{n=0}^{\infty} r^n z^n$

4. ✔ $\sum_{n=0}^{\infty} n^2 a_n z^n$

Question Number : 76 Question Id : 59425311105 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

Let $D_1 = \{z \in \mathbb{C} / \ |z| < 1\}, f : D_1 \to D_1$ be analytic. If $f(0) = 0$, $f(\frac{1}{2}) = -\frac{1}{2}$, then $f(\frac{1+i}{2})$ is

Options :

1. ✖ $-\frac{1}{2}(1+i)$

2. ✔ $\frac{1}{2}(1-i)$

3. ✖ $\frac{1}{2}(-1+i)$

4. ✖ not uniquely determined using the given data

Question Number : 77 Question Id : 59425311106 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

Consider the following statements.

S_1 : If $\Omega \subset \mathbb{C}$ is open, $f : \overline{\Omega} \to \mathbb{C}$ is continuous, f is analytic on Ω, then $\sup_{z \in \partial\Omega} |f(z)| = \sup_{z \in \Omega} |f(z)|$, where $\partial\Omega$ is the boundary of Ω.

S_2 : Let $D_1 = \{z \in \mathbb{C} / \ |z| < 1\}, f : \bar{D}_1 \to \mathbb{C}$ be continuous and f be analytic on D_1. If $\min_{\partial\Omega} |f(z)| = 1, \max_{\partial\Omega} |f(z)| = 3$ then $1 \leq |f(z)| \leq 3$, $\forall z \in \Omega$.

Then

Options :

1. ✖ S_1 is true, S_2 is false

2. ✔ S_2 is true, S_1 is false

3. ✖ both S_1 and S_2 are true

4. ✖ S_1 is false and S_2 is false

Question Number : 78 Question Id : 59425311107 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

If the order and degree of the ordinary differential equation $(y''(x))^3 + (y'(x))^2 + y^2(x) = f(x)$ are p and q, respectively, then $(p, q) =$

Options :

1. ✖ $(1, 2)$

2. ✖ $(2, 3)$

3. ✖ $(3, 2)$

4. ✔ $(2, 2)$

Question Number : 79 Question Id : 59425311108 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum

Instruction Time : 0
Correct Marks : 1 Wrong Marks : 0.25

If y is the solution of $y' = 1 + y^2$, $y(0) = 0$, then $y(\frac{\pi}{4}) =$

Options :

1. ✖ 0

2. ✖ 1

3. ✔ $\sqrt{3}$

4. ✖ 3

Question Number : 80 Question Id : 59425311109 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0
Correct Marks : 1 Wrong Marks : 0.25

If $y'(x) + y(x)\tan x = \cos x$, $y(0) = 0$ then $y(\pi) =$

Options :

1. ✔ π

2. ✖ 2π

3. ✖ $-\pi$

4. ✖ -2π

Question Number : 81 Question Id : 59425311110 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0
Correct Marks : 1 Wrong Marks : 0.25

Which of the following differential equations is **NOT** exact?

Options :

1. ✖ $\frac{y}{x^2+y^2}dx - \frac{x}{x^2+y^2}dy = 0$

2. ✖ $\frac{1}{x}dx - \frac{1}{y}dy = 0$

3. ✖ $ydx - xdy = 0$

4. ✔ $\frac{1}{y}dx - \frac{x}{y^2}dy = 0$

Question Number : 82 Question Id : 59425311111 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

The solution of the differential equation $y(x) = xy'(x) + \sqrt{4 + (y'(x))^2}$ is

Options :

1. ✖ $(y - cx)^2 - 4 - c^2 = 0$, where $c \in \mathbb{R}$ is arbitrary

2. ✖ $(y - cx)^2 + 4c^2 = 0$, where $c \in \mathbb{R}$ is arbitrary

3. ✔ $(y - cx)^2 - c^2 = 0$, where $c \in \mathbb{R}$ is arbitrary

4. ✖ $(y - cx)^2 - 4c^2 = 0$, where $c \in \mathbb{R}$ is arbitrary

Question Number : 83 Question Id : 59425311112 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

An integrating factor for $(x+1)y'(x) - y(x) = (x+1)^2 e^{3x}$ is

Options :

1. ✖ $x+1$

2. ✔ $\frac{1}{(x+1)^2}$

3. ✖ $\frac{1}{x+1}$

4. ✖ $(x-1)^2$

Question Number : 84 Question Id : 59425311113 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

If $y = x$ is a solution of the differential equation $x^2\frac{d^2y}{dx^2}+2x\frac{dy}{dx}-2y=0$, then which of the following is another solution?

Options :

1. ✖ x^2

2. ✖ x^{-2}

3. ✔ $x\log x$

4. ✖ xe^x

Question Number : 85 Question Id : 59425311114 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

Let $p = \frac{\partial z}{\partial x}$ and $q = \frac{\partial z}{\partial y}$. Then the partial differential equations $f(x,y,z,p,q) = 0$ and $g(x,y,z,p,q) = 0$ are said to be compatible if

Options :

1. ✔ every solution of $f(x, y, z, p, q) = 0$ is a solution of $g(x, y, z, p, q) = 0$

2. ✖ every solution of $g(x, y, z, p, q) = 0$ is a solution of $f(x, y, z, p, q) = 0$

3. ✖ $f(x, y, z, p, q) = 0$ and $g(x, y, z, p, q) = 0$ have one parameter family of common solutions

4. ✖ $f(x, y, z, p, q) = 0$ and $g(x, y, z, p, q) = 0$ have a unique common solution

Question Number : 86 Question Id : 59425311115 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

Let $p = \dfrac{\partial z}{\partial x}$ and $q = \dfrac{\partial z}{\partial y}$. Then which of the following is a complete integral of $x^2p^2 + y^2q^2 = 4$?

Options :

1. ✖ $z = \sqrt{4 - a^2}\log x + a\log y$, where $a \in \mathbb{R}$, $|a| < 2$

2. ✖ $z = \sqrt{4 - a^2}\log y + a\log x + b$, where $a, b \in \mathbb{R}$, $|a| < 2$

3. ✔ $z = a\log x + b\log y$, where $a, b \in \mathbb{R}$

4. ✖ $z = \sqrt{4 - a^2} + a\log x + a$, where $a \in \mathbb{R}$, $|a| < 2$

Question Number : 87 Question Id : 59425311116 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

The second order partial differential equation $\dfrac{\partial^2 u}{\partial x^2} + x\dfrac{\partial^2 u}{\partial y^2} = x^2 + y^2$ is

Options :

1. ✖ hyperbolic for $x < 0$

2. ✖ hyperbolic for $x > 0$

3. ✖ elliptic for $x < 0$

4. ✔ parabolic for $x > 0$

Question Number : 88 Question Id : 59425311117 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

The general solution of $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial x \partial y} - 6\frac{\partial^2 z}{\partial y^2} = 0$ is

Options :

1. ✖ $f_1(y+3x) + f_2(y+2x)$, where f_1 and f_2 are arbitrary C^2 functions

2. ✖ $f_1(y-3x) + f_2(y-2x)$, where f_1 and f_2 are arbitrary C^2 functions

3. ✔ $f_1(y+3x) + f_2(y-2x)$, where f_1 and f_2 are arbitrary C^2 functions

4. ✖ $f_1(y-3x) + f_2(y+2x)$, where f_1 and f_2 are arbitrary C^2 functions

Question Number : 89 Question Id : 59425311118 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

A particular integral of $\frac{\partial^2 z}{\partial x^2} - 4\frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = \cos(x-2y)$ is

Options :

1. ✖ $\frac{-\cos(x-2y)}{13}$

2. ✖ $\frac{\cos(x-2y)}{13}$

3. ✔ $\frac{\cos(2y-x)}{13}$

4. ✖ $\frac{-\cos(2y-x)}{13}$

Question Number : 90 Question Id : 59425311119 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

If $u(x,t)$ is a solution of $\frac{\partial^2 u}{\partial x^2} - 9\frac{\partial^2 u}{\partial t^2} = 0$, with $u(x,0) = 0$, $\frac{\partial u}{\partial t}(x,0) = x$, $0 \leq x \leq \infty$, then $u(2,1) =$

Options :

1. ✖ 2

2. ✖ 4

3. ✖ 6

4. ✔ 8

Question Number : 91 Question Id : 59425311120 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

Direction ratios of the line $x+y+z=0, x+y=0$ are

Options :

1. ✖ $(1, 1, 0)$

2. ✔ $(1, -1, 0)$

3. ✖ $(-1, -1, -1)$

4. ✖ $(-1, 1, -1)$

Question Number : 92 Question Id : 59425311121 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

The equation of the plane parallel to $2x + 3y + 7z = 10$, and passing through $(0, 1, -1)$ is

Options :

1. ✖ $2x + 3y + 7z = 4$

2. ✖ $2x + 3y + 7z + 4 = 0$

3. ✖ $2x + 3y + 3z = 3$

4. ✔ $2x + 3y + 7z + 3 = 0$

Question Number : 93 Question Id : 59425311122 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

The distance between $(1, 1, 1)$ and the plane $x + 2y + 2z = 6$ is

Options :

1. ✔ 3

2. ✖ 1

3. ✖ $\frac{1}{3}$

4. ✖ $\frac{1}{\sqrt{3}}$

Question Number : 94 Question Id : 59425311123 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

The equation of the line through $(1,2,3)$ and orthogonal to $x+2y+3z=10$ is

Options :

1. ✖ $\frac{x-1}{1}=\frac{y-2}{2}=\frac{z-3}{3}$

2. ✔ $\frac{x-1}{3}=\frac{y-2}{2}=\frac{z-3}{1}$

3. ✖ $\frac{x-1}{1}=\frac{y-2}{3}=\frac{z-3}{2}$

4. ✖ $\frac{x-1}{2}=\frac{y-2}{1}=\frac{z-3}{3}$

Question Number : 95 Question Id : 59425311124 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

Suppose S is a sphere passing through $P(2,2,2), Q(0,0,0)$. If the length of $\overline{PQ}$ is the same as the diameter of S, then the equation of S is

Options :

1. ✖ $x^2+y^2+z^2+2x+2y+2z=0$

2. ✔ $x^2+y^2+z^2-2x-2y-2z=0$

3. ✖ $x^2+y^2+z^2-4x-4y-4z=0$

4. ✖ $x^2+y^2+z^2+4x+4y+4z=0$

Question Number : 96 Question Id : 59425311125 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

The equation of the tangent plane to the sphere $x^2+y^2+z^2-4x-4y-4z+3=0$ at $(1,0,4)$ is

Options :

1. ✖ $x-2z+7=0$

2. ✖ $x+2z-9=0$

3. ✖ $x+2y-2z+7=0$

4. ✔ $x+2y+4z-17=0$

Question Number : 97 Question Id : 59425311126 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

The maximum number of common tangent planes to the spheres $x^2+y^2+z^2=1, (x-10)^2+(y-20)^2+(z-30)^2=1$ is

Options :

1. ✖ 1

2. ✖ 2

3. ✖ 3

4. ✔ 4

Question Number : 98 Question Id : 59425311127 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

The equation $2xy + 4yz + 7xz = 0$ represents a

Options :

1. ✖ sphere

2. ✖ pair of straight lines

3. ✖ cone

4. ✔ cylinder

Question Number : 99 Question Id : 59425311128 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

The angle between the planes $2x - y + z = 6$ and $x + y + 2z = 7$ is

Options :

1. ✖ $\cos^{-1}\left(\frac{4}{\sqrt{21}}\right)$

2. ✖ $\frac{\pi}{3}$

3. ✔ $\frac{\pi}{6}$

4. ✖ $\frac{\pi}{2}$

Question Number : 100 Question Id : 59425311129 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.25

The equation of the line joining the points $(-2, 4, 2)$ and $(7, -2, 5)$ is

Options :

1. ✔ $\frac{x}{-1} = \frac{y}{2} = \frac{z}{1}$

2. ✖ $\frac{x+2}{7} = \frac{y+4}{-2} = \frac{z+2}{5}$

3. ✖ $\frac{x+7}{3} = \frac{y-2}{2} = \frac{z+5}{1}$

4. ✖ $\frac{x+2}{3} = \frac{y-4}{-2} = \frac{z-2}{1}$