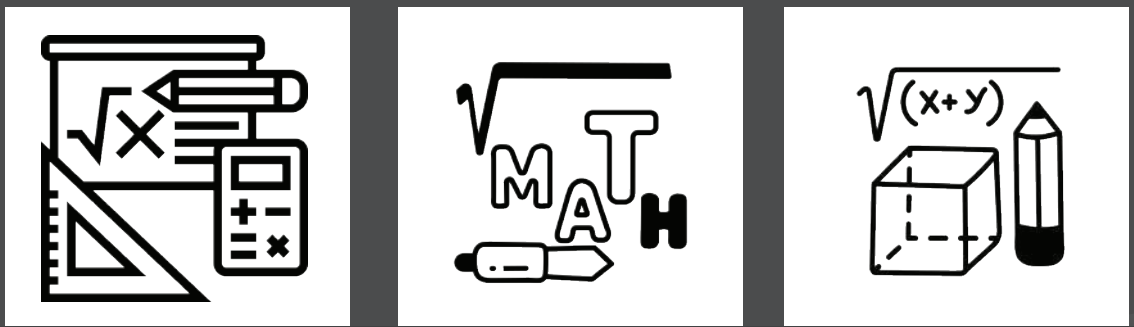
CUET UG 2025

MATHEMATICS

2022 TO 2024

PREVIOUS YEAR QUESTION WITH
DETAILED EXPLANATIONS



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PREFACE

The principal purpose of writing this book **"CUET-UG Mathematics PYQ Solutions"** is to cater to the needs of the candidates aspiring for **"CUET-UG Mathematics"** exam. It provides explanations of the previous year questions from the year **2022 to 2024**. To help students, we have compiled this book in a user-friendly and well-structured manner. B**ook includes ten chapters** as per the syllabus. **Questions are sorted year-wise**. This fine sorting of questions will help the students to prepare for each subtopic effectively. In the end, **four mock tests** have been included for comprehensive practice and preparation.

The book will help the reader to understand and solve all the previous year questions. Regular practice is the key to success in any competitive exam, and this book allows you to hone your problem-solving skills. We have tried to keep the material as simple as possible with easy explanations.

A word or suggestion from your side may add another feather to the cap in the compilation of questions in this book. The author looks forward to the comments, suggestions, and criticism from the students. Constructive suggestions and user feedback would be highly appreciated, gratefully acknowledged, and suitably incorporated. We wish all the best to all aspirants who are preparing for these exams.

ACKNOWLEDGEMENT

Writing this book has been an amazing journey. First of all, we would like to thank brilliant students at Institute for Advanced Studies (IFAS), whose constant demand for such a book has been big motivation behind writing and shaping of this book. We want to extend our sincere appreciation to **Mr. Radheshyam Choudhary**, Director at IFAS Publications and **Dr. Kailash Choudhary**, Founder of IFAS. Our special thanks to **Mr. Dadasaheb Sondge & Mr. Digambar Jagtap** for their valuable support and critical suggestions for bringing out the book in its present form.

We would like to thank **Mr. Omkar Girkar, Ms. Chetana Deshmukh, Ms. Dhanashree Bhosale** for assistance in writing solutions of previous year questions and also compiling mock tests along with explanations.

This book is a team effort and producing it would be impossible without helping and supportive people at IFAS Publications. We are thankful to the team at IFAS Publications, most notably **Ms. Gitanjalee Jadhav** for helpful suggestions to improve the quality of the content and regular reminders for timely completion of the project. It has been a pleasure to work with **Mr. Vikendra Metha & Mr. Kuldeep Singh** who took great care during the copy-editing and production processes of this book.

And finally, our humble greetings to all who put their significant efforts and are unmentioned.

ABOUT CUET-UG EXAM

The National Testing Agency (NTA) conducts the Common University Entrance Test (CUET), once a year for admission to undergraduate courses at various universities/colleges across India.

CUET UG Mathematics Exam Pattern

There are 2 sections in the CUET-UG Mathematics Exam:

- Section A
- Section B (Section B1 and Section B2)

Section A is mandatory for all. It consists of **15 questions** covering both Mathematics and Applied Mathematics.

You can **either attempt Section B1 or B2 as per your choice.**

Section B1 will have 35 questions from Core Mathematics, of which 25 must be attempted.

Section B2 will have 35 questions from Applied Mathematics, of which 25 must be attempted.

EXAM DETAILS

Mode of the examination	Offline/Online
Language	13 Languages (English, Kannada, Hindi, Punjabi, Marathi, Tamil, Urdu, Malayalam, Odia, Assamese, Telugu, Bengali, and Gujarati)
Duration of exam	1 hour
Total number of questions in the exam	50 (15 in Section A and 35 in Section B1/B2)
Total number of questions to be answered	40 (15 in Section A and 25 in Section B1/B2)
Type of questions	MCQ
Marking scheme	+5 for correct answer -1 for incorrect answer
Total marks	200

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NUMBER OF QUESTIONS ASKED IN CUET-UG MATHEMATICS (2022 to 2024)					
TOPIC		2022	2023	2024	
				Online Shift 1	Offline Shift 3
1	*Relations and Functions*	3	5	1	1
2	*Algebra*	5	8	14	13
3	*Calculus*	22	17	24	26
4	*Differential Equations*	4	3	4	3
5	*Vectors and Three Dimensional Geometry*	13	5	7	7
6	*Probability and Statistics*	10	11	17	16
7	*Linear Programming*	2	6	6	6
8	*Numbers, Quantification and Numerical Applications*	19	9	6	8
9	*Index Numbers and Time Based Data*	3	3	1	1
10	*Financial Mathematics*	4	3	5	4

Relations & Functions

UNIT 1

SYLLABUS

RELATIONS & FUNCTIONS

TYPES OF RELATIONS: REFLEXIVE, SYMMETRIC, TRANSITIVE & EQUIVALENCE RELATIONS. ONE TO ONE & ONTO FUNCTIONS, COMPOSITE FUNCTIONS, INVERSE OF A FUNCTION, BINARY OPERATIONS

INVERSE TRIGONOMETRIC FUNCTIONS

DEFINITION, RANGE, DOMAIN, PRINCIPAL VALUE BRANCHES. GRAPHS OF INVERSE TRIGONOMETRIC FUNCTIONS. ELEMENTARY PROPERTIES OF INVERSE TRIGONOMETRIC FUNCTIONS.

CHAPTER 1

Relations & Functions

PREVIOUS YEAR EXAM QUESTIONS

[2022 Shift-1]

1. Match List I with List II

List I	List II
A. $R = \{(x, y)$: x and y are student of the same school$\}$	I. Symmetric
B. $R = \{(L_1, L_2): L_1 \perp L_2, L_1, L_2 \in L$, where L is a set of all lines$\}$	II. one-one
C. A function $f: R \to R$ defined by $f(x) = 2 - 3x$ is	III. bijective
D. A function $f: [0, 1] \to R$ defined by $f(x) = 1 + x^2$ is $f: [0, 1] \to R$	IV. Equivalence

Choose the correct answer from the options given below:

(1) A-I, B-IV, C-II, D-III (2) A-IV, B-I, C-III, D-II

(3) A-I, B-IV, C-III, D-II (4) A-IV, B-I, C-II, D-III

[2022 Shift-1]

2. The value of $\tan^{-1}\left[2\sin\left\{2\cos^{-1}\left(\frac{\sqrt{3}}{2}\right)\right\}\right]$, is:

(1) $\frac{\pi}{3}$ (2) $\frac{2\pi}{3}$

(3) $-\frac{\pi}{3}$ (4) $\frac{\pi}{6}$

[2022 Shift-1]

3. Match List I with List II

LIST I	LIST II
A. The range of $\sin^{-1} x$ is	I. $\left[\frac{-\pi}{2}, \frac{\pi}{2}\right] - \{0\}$
B. The range of $\tan^{-1} x$ is	II. $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$
C. The range of $\text{cosec}^{-1} x$ is	III. $[0, \pi] - \left\{\frac{\pi}{2}\right\}$
D. The range of $\sec^{-1} x$ is	IV. $\left[\frac{-\pi}{2}, \frac{\pi}{2}\right]$

Choose the correct answer from the options given below:

(1) A-IV, B-III, C-II, D-I (2) A-IV, B-I, C-III, D-II

(3) A-I, B-IV, C-II, D-III (4) A-IV, B-II, C-I, D-III

[2023, Shift-1]

4. Let $A = \{1, 2, 3\}$. Consider the relation $R = \{(1, 1), (2. 2), (3, 3), (1, 2), (2, 3), (1, 3)\}$. Then R is

(1) reflexive only

(2) reflexive and transitive

(3) symmetric and transitive

(4) neither symmetric nor transitive

[2023, Shift-1]

5. If $f: \mathbf{R} \to \mathbf{R}$ is defined by $f(x) = \sin x + x$, then $f(f(x))$ is:

(1) $2\sin x + 2x$

(2) $\sin^2 x + x^2$

(3) $\sin(\sin x + x) + \sin x + x$

(4) $\sin^2 x + 2\sin x + x$

[2023, Shift-1]

6. Value of $\frac{e^{\sin\left(\tan^{-1} x + \cot^{-1} x\right)}}{e^{\sin(\sin^{-1} x + cos^{-1} x)}}, x \in [-1, 1]$, is:

(1) 0 (2) $\frac{\pi}{2}$

(3) 1 (4) $-\frac{\pi}{2}$

[2023, Shift-1]

7. Match List I with List II

LIST I		LIST II	
A.	$\sin^{-1} x + \cos^{-1} x, x \in [-1,1]$	I.	$-\frac{\pi}{2}$
B.	$\tan^{-1}\sqrt{3} - \cot^{-1}(-\sqrt{3})$	II.	$-\frac{\pi}{6}$
C.	$\cos^{-1}\left(\cos\frac{13\pi}{6}\right)$	III.	$\frac{\pi}{2}$
D.	$\sin^{-1}\left(-\frac{1}{2}\right)$	IV.	$\frac{\pi}{6}$

Choose the correct answer from the options given below:

(1) A-III, B-I, C-IV, D-II (2) A-IV, B-I, C-II, D-III

(3) A-II, B-III, C-IV, D-I (4) A-I, B-II, C-III, D-IV

[2023, Shift-1]

8. The range of the function $f(x) = \frac{1}{3 - \sin 4x}$ is:

(1) $\left[\frac{1}{4}, \frac{1}{2}\right]$ (2) $\left[\frac{1}{2}, 1\right]$

(3) $\left[\frac{1}{4}, \frac{3}{4}\right]$ (4) $\left[\frac{1}{2}, \frac{3}{4}\right]$

[2024, Shift-3]

9. Let R be the relation over the set A of all straight lines in a plane such that $l_1 R l_2 \Leftrightarrow l_1$ is parallel to l_2. Then R is:

(1) Symmetric
(2) An Equivalence relation
(3) Transitive
(4) Reflexive

[2024, Shift-1]

10. Relation R on the set $A = \{1, 2, 3, \ldots, 13, 14\}$ defined as $R = \{(x, y): 3x - y = 0\}$ is:

(1) Reflexive, symmetric and transitive
(2) Reflexive and transitive but not symmetric
(3) Neither reflexive nor symmetric but transitive
(4) Neither reflexive nor symmetric nor transitive

Answer Key									
1	2	3	4	5	6	7	8	9	10
(2)	(1)	(4)	(2)	(3)	(3)	(1)	(1)	(2)	(4)

EXPLANATION

1. Correct Answer is (2):

(A) $R = \{(x, y): x \text{ and } y \text{ are students of the same school}\}$
This relation represents a situation where two students x and y are related if they belong to the same school. This is an **equivalence relation**, because:
It is **reflexive**: A student is in the same school as themselves.
It is **symmetric**: If x and y are in the same school, then y and x are also in the same school.
It is **transitive**: If x and y are in the same school, and y and z are in the same school, then x and z are also in the same school.
Hence, **A corresponds to IV. Equivalence**.

(B) $R = \{(L_1, L_2): L_1 \perp L_2, L_1, L_2 \in L\}$
This relation defines that two lines L_1 and L_2 are related if they are **perpendicular** to each other. Perpendicularity is a **symmetric** relation because if $L_1 \perp L_2$, then $L_2 \perp L_1$.
Hence, **B corresponds to I. Symmetric**.

(C) A function $f: \mathbb{R} \to \mathbb{R}$ defined by $f(x) = 2 - 3x$
This function is **bijective** because it is both **one-to-one** (injective) and **onto** (surjective). To verify:
Injective: For $f(x_1) = f(x_2)$, we solve $2 - 3x_1 = 2 - 3x_2$, which simplifies to $x_1 = x_2$, proving injectivity.
Surjective: For every $y \in \mathbb{R}$, we can solve $y = 2 - 3x$ for x, so the function is surjective.
Hence, **C corresponds to III. Bijective**.

(D) A function $f: [0,1] \to \mathbb{R}$ defined by $f(x) = 1 + x^2$
This function is **one-to-one** (injective) but not onto (surjective). For injective, if $f(x_1) = f(x_2)$, then $1 + x_1^2 = 1 + x_2^2$, which simplifies to $x_1 = x_2$, so the function is injective. However, it is not onto because not all real numbers are reachable from the domain $[0,1]$.
Hence, **D corresponds to II. One-one**.
Thus, the correct answer is (2) A-IV, B-I, C-III, D-II.

2. Correct Answer is (1):

$\tan^{-1}\left[2\sin\left\{2\cos^{-1}\left(\frac{\sqrt{3}}{2}\right)\right\}\right] = \tan^{-1}\left[2\sin\left\{2\frac{\pi}{6}\right\}\right] = \tan^{-1}\left[2\sin\frac{\pi}{3}\right] = \tan^{-1}\sqrt{3} = \frac{\pi}{3}$

3. Correct Answer is (4):

(1) $\sin^{-1}(x)$:
Domain: $x \in [-1,1]$
Range: $[-\pi/2, \pi/2]$
Matches with IV.

(2) $\tan^{-1}(x)$**:**
Domain: $x \in (-\infty, \infty)$
Range: $(-\pi/2, \pi/2)$ (open interval)
Matches with II.

(3) $\csc^{-1}(x)$**:**
Domain: $x \in (-\infty, -1] \cup [1, \infty)$
Range: $[-\pi/2, \pi/2] - \{0\}$
Matches with I.

(4) $\sec^{-1}(x)$**:**
Domain: $x \in (-\infty, -1] \cup [1, \infty)$
Range: $[0, \pi] - \{\pi/2\}$
Matches with III.
Thus, the correct answer is (4) A-IV, B-II, C-I, D-III

4. Correct Answer is (2): We analyze the given relation $R = \{(1,1), (2,2), (3,3), (1,2), (2,3), (1,3)\}$ on $A = \{1,2,3\}$ to determine its properties.

Reflexivity
A relation R is reflexive if $(a, a) \in R$ for every $a \in A$.
Here, $(1,1), (2,2), (3,3) \in R$, so R is reflexive.

Symmetry
A relation R is symmetric if $(a, b) \in R$ implies $(b, a) \in R$.
$(1,2) \in R$, but $(2,1) \notin R$.
$(2,3) \in R$, but $(3,2) \notin R$.
Thus, R is **not symmetric**.

Transitivity
A relation R is transitive if $(a, b) \in R$ and $(b, c) \in R$ imply $(a, c) \in R$.

$(1,2) \in R$ and $(2,3) \in R$, and $(1,3) \in R$, so transitivity holds for these elements.
There are no other cases where transitivity could be violated.
Thus, R is **transitive**.
So, option **(2) reflexive and transitive** is correct.

5. Correct Answer is (3):
We need to determine $f(f(x))$ for $f(x) = \sin x + x$.
Substituting $f(x) = \sin x + x$ into $f(f(x))$:
$f(f(x)) = f(\sin x + x)$
Using the definition of $f(x)$, replace x in $f(x)$ with $\sin x + x$:
$f(f(x)) = \sin(\sin x + x) + (\sin x + x)$
Thus, the expression becomes:
$f(f(x)) = \sin(\sin x + x) + \sin x + x$
The correct option is **(3)** $\sin(\sin x + x) + \sin x + x$.

6. Correct Answer is (3):
We need to evaluate:
$\frac{e^{\sin(\tan^{-1} x + \cot^{-1} x)}}{e^{\sin(\sin^{-1} x + \cos^{-1} x)}}, x \in [-1,1]$.
Step 1: Simplify the numerator
(1) Using the identity $\tan^{-1} x + \cot^{-1} x = \frac{\pi}{2}$, the numerator becomes: $e^{\sin(\tan^{-1} x + \cot^{-1} x)} = e^{\sin\left(\frac{\pi}{2}\right)}$.
(2) Since $\sin\left(\frac{\pi}{2}\right) = 1$, the numerator simplifies to: $e^1 = e$.
Step 2: Simplify the denominator
(1) Using the identity $\sin^{-1} x + \cos^{-1} x = \frac{\pi}{2}$, the denominator becomes: $e^{\sin(\sin^{-1} x + \cos^{-1} x)} = e^{\sin\left(\frac{\pi}{2}\right)}$.
(2) Again, since $\sin\left(\frac{\pi}{2}\right) = 1$, the denominator simplifies to: $e^1 = e$.
Step 3: Simplify the fraction $\frac{e}{e} = 1$.
Thus, the value is **1**, and the correct option is **(3)**.

7. Correct Answer is (1): We need to match the items in **List I** with their corresponding values in **List II**. Let's solve each case:
(A) $\sin^{-1} x + \cos^{-1} x, x \in [-1,1]$
The identity:
$\sin^{-1} x + \cos^{-1} x = \frac{\pi}{2}, \forall x \in [-1,1]$.
Thus, $\sin^{-1} x + \cos^{-1} x = \pi/2$.
A → III.
(B) $\tan^{-1}\sqrt{3} - \cot^{-1}(-\sqrt{3})$
Note that $\tan\left(\frac{\pi}{3}\right) = \sqrt{3}$ and $\cot\left(\frac{\pi}{2} + \frac{\pi}{3}\right) = -\sqrt{3}$
$\tan^{-1}\sqrt{3} - \cot^{-1}(-\sqrt{3}) = \frac{\pi}{3} - \left(\frac{\pi}{2} + \frac{\pi}{3}\right) = -\frac{\pi}{2}$.
B → I.
(C) $\cos^{-1}(\cos 13\pi/6)$
Using the periodicity property of cosine:
$\cos^{-1}(\cos\theta) = \theta$ if $\theta \in [0, \pi]$.
However, $13\pi/6$ lies outside the principal range. Reduce $13\pi/6$ within $[0,2\pi]$:
$13\pi/6 - 2\pi = 13\pi/6 - 12\pi/6 = \pi/6$.
Thus:
$\cos^{-1}(\cos 13\pi/6) = \pi/6$.
C → IV.
(D) $\sin^{-1}(-1/2)$
The sine function is odd, so:
$\sin^{-1}(-x) = -\sin^{-1}(x)$.
Hence:
$\sin^{-1}(-1/2) = -\sin^{-1}(1/2)$.
From the unit circle, $\sin^{-1}(1/2) = \pi/6$. Thus:
$\sin^{-1}(-1/2) = -\pi/6$.
D → II.
Thus, option (1) is correct.

8. Correct Answer is (1):
Given: $f(x) = \frac{1}{3 - \sin 4x}$
(1) Range of $\sin(4x)$:
The sin function $\sin(4x)$ oscillate between -1 & 1.
Thus, $\sin(4x) \in [-1,1]$
(2) Range of $3 - \sin(4x)$
Subtracting $\sin(4x)$ from 3
$3 - \sin(4x) \in [3-1, 3-(-1)] = [2, 4]$
The reciprocal function $f(x) = \frac{1}{3-\sin(4x)}$ is defined for all x because $3 - \sin(4x) \neq 0$.
If $x \in [2, 4]$, then $\frac{1}{x}$ maps $[2, 4]$ to $\left[\frac{1}{4}, \frac{1}{2}\right]$.

9. Correct Answer is (2): The relation R is defined as $l_1 R l_2 \Leftrightarrow l_1$ is parallel to l_2.
Reflexivity: A line is parallel to itself, so $l_1 R l_1$ holds for all l_1, so the relation is reflexive.
Symmetry: If l_1 is parallel to l_2, then l_2 is parallel to l_1, so the relation is symmetric.
Transitivity: If l_1 is parallel to l_2 and l_2 is parallel to l_3,then l_1 is parallel to l_3, so the relation is transitive.
Since all three properties hold, the relation R is an equivalence relation.

10. Correct Answer is (4): We need to find all ordered pairs (x, y) such that $3x - y = 0$, i.e., $y = 3x$ for x, y in the set A.
Thus, we have,
$R = \{(1,3), (2,6), (3,9), (4,12)\}$

Reflexive: A relation is reflexive if for every element $x \in A$, the pair $(x, x) \in R$. But this is not the case here.

Symmetric: A relation is symmetric if $(x, y) \in R$, then $(y, x) \in R$ for all (x, y).

Since $(1,3) \in R$ but $(3,1) \notin R$, the relation is not symmetric.

Transitive: A relation is transitive if $(x, y) \in R$ and $(y, z) \in R$, then $(x, z) \in R$ for all $x, y, z \in A$.

Since $(1,3) \in R$ and $(3,9) \in R$, but $(1,9) \notin R$, the relation is not transitive.

MOCK TEST

1

MOCK TEST

1. If $A=\begin{bmatrix}1 & 2 & x\\ 0 & 1 & 0\\ 0 & 0 & 1\end{bmatrix} B=\begin{bmatrix}1 & -2 & y\\ 0 & 1 & 0\\ 0 & 0 & 1\end{bmatrix}$ and $AB=I_3$, where I_3 the unit matrix of order is 3×3 then $x+y$ is equal to:

(1) 0 (2) -1

(3) 2 (4) -2

2. If $A=\begin{bmatrix}x & 1\\ 1 & 0\end{bmatrix}$ and $A=A^{-1}$, then the value of x is:

(1) 0 (2) 1

(3) 2 (4) 3

3. If x,y,z are different and $\Delta=\begin{vmatrix}x & x^2 & 1+x^3\\ y & y^2 & 1-y^3\\ z & z^2 & 1+z^3\end{vmatrix}=0$, then the value of xyz is:

(1) 1 (2) 0

(3) - (4) 2

4. If the point, (2, -3), $(\lambda,-1)$ and (0, 4) are collinear, then the value of λ is:

(1) $\frac{1}{3}$ (2) 3

(3) $\frac{7}{10}$ (4) $\frac{10}{7}$

5. If $y=10^{10^x}, then \frac{dy}{dx}$ is :

(1) $10^{10^x}(\log 10)$ (2) $10^{10^x}(\log 10)^2$

(3) $10^{10^x}10^x(\log 10)^2$ (4) $10^{10^x}10^x(\log 10)$

6. The tangent to the parabola, $x^2=2y$ at the point $(1,\frac{1}{2})$ makes with $x-axis$ an angle of:

(1) 0^0 (2) 45^0

(3) 30^0 (4) 60^0

7. The function $f(x)=x^3, x\in R$ has:

(1) Maximum value at $x=0$

(2) Minimum value at $x=0$

(3) Neither maximum nor minimum value at $x=0$

(4) Maximum value and minimum value at $x=0$

8. If $f(x)=\begin{cases}2x+8, & 1\le x\le 2\\ 6x, & 2<x<4\end{cases}$, then $\int_1^4 f(x)$ is:

(1) 43 (2) 45

(3) 47 (4) 46

9. The area of the region bounded by the line $2y-5x+7$, $x-axis$ and the lines $x-1$ and $x-3$ is:

(1) 15 (2) 17

(3) 16 (4) 19

10. The integrating factor of the differential equation $(1+y^2)dx-(\tan^{-1}y-x)dy=0$, is :

(1) $\tan^{-1}y$ (2) $e^{\tan^{-1}y}$

(3) $\frac{1}{1+y^2}$ (4) $\frac{1}{x(1+y^2)}$

11. The order and the degree of the differential equation $\frac{d^2y}{dx^2}=\left(1+\frac{dy}{dx}\right)^{\frac{1}{2}}$ Respectively are:

(1) order -2 , degrees -1

(2) order $=2$, degree $=2$

(3) order $=1$, degree $=2$

(4) order -1, degree -1

12. Which of the following is correct?

(1) Every LPP admits an optimal solution.

(2) Every LPP admits a unique solution.

(3) The optimal value does not occur at a corner print of the feasible region only.

(4) If a LPP admits optimal solution at two points, then it has optimal solution at infinite number of points

13. The comer points of feasible region determined by the system of linear constraints are $(0,3),(1,1)$ and (3,0). Let $Z=px+qy$ where $p,q>0$. The conditions on p and q so that, minimum of Z occurs at $(3,0)$ and $(1,1)$ is:

(1) $p-2q$ (2) $p=\frac{q}{2}$

(3) $p-3q$ (4) $p=q$

14. The mean of the numbers obtained on throwing a die having written 1 on three faces, 2 on two faces and 5 on 1 face is:

(1) 1 (2) 2

(3) 5 (4) $\frac{8}{3}$

15. If $P(A) - \frac{3}{10} \cdot P(B) - \frac{2}{5}$ and $P(A \cup B) - \frac{3}{5}$, then $P\left(\frac{B}{A}\right) + P\left(\frac{A}{B}\right)$ is equal to:

(1) $\frac{1}{4}$ (2) $\frac{1}{3}$

(3) $\frac{5}{12}$ (4) $\frac{7}{12}$

16. The relation R in the set $A - (1.2.3.4)$ is given by $R - \{(1,2),(2,2),(1,1),(4,4),(1,3),(3,3),(3,2)\}$ is:

(1) Reflexive and symmetric but not transitive

(2) Reflexive and transitive but not symmetric

(3) Symmetric and transitive but not reflexive

(4) an equivalence relation

17. If $f(x) - 27x^3$ and $g(x) = (x)^{\frac{1}{3}}$, then go $f(x)$ is:

(1) x (2) $2x$

(3) $3x$ (4) 0

18. Principal value of $\tan^{-1}(-\sqrt{3}) + \tan^{-1}(1)$ is:

(1) $\frac{\pi}{12}$ (2) $\frac{\pi}{4}$

(3) $-\frac{\pi}{12}$ (4) $\frac{\pi}{2}$

19. The principal value of $\sin^{-1}\left(-\frac{1}{2}\right)$ is:

(1) $-\frac{\pi}{6}$ (2) $\frac{\pi}{6}$

(3) $\frac{\pi}{3}$ (4) $-\frac{\pi}{3}$

20. If A is an invertible matrix, such that $A^2 - A + I = 0$, then the imverse of A is:

(1) A^{-2}

(2) I-A. where I is an identity matrix of order 2

(3) 9

(4) A

21. The determinant $\begin{vmatrix} x & \sin\theta & \cos\theta \\ \sin\theta & -x & 1 \\ \cos\theta & 1 & x \end{vmatrix}$ is:

(1) independent of θ only

(2) independent of x only

(3) independent of both 0 and x

(4) independent of x but not of θ

22. The value of K for which the matrix $\begin{pmatrix} 0 & 2 & k \\ 2 & 0 & 5 \\ -3 & 5 & 0 \end{pmatrix}$ is a symmetric matrix is given by:

(1) 3 (2) -3

(3) 0 (4) 1

23. The value of λ for which the matrix $\begin{pmatrix} 1 & 0 & \lambda \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{pmatrix}$ is a singular matrix is:

(1) 0 (2) -1

(3) 1 (4) 2

24. If the order of a matrix A is 2×3, the onder of matrix B is 3×4 and the order of matrix C is 3×4, then the order of the matrix (A. B). C^T is

(1) 2×3 (2) 3×3

(3) 3×4 (4) 4×3

25. The value of the determinant $\begin{vmatrix} x+y & y+z & z+x \\ z & x & y \\ 1 & 1 & 1 \end{vmatrix}$ is:

(1) 1 (2) 2

(3) 0 (4) 1

26. Match List I with List II

List (Functions)	List (Derivatives)
(A) $f(x) = \sin^{-1} x$	I. $\frac{1}{1+x^2}, x \in R$
(B) $f(x) = \tan^{-1} x$	II. $\frac{1}{\sqrt{1-x^2}}, x \in (-1,1)$
(C) $f(x) = \cos^{-1} x$	III. $\frac{1}{\sqrt{1-x^2}}, x \in (-1,1)$
(D) $f(x) = \cos^{-1} x$	IV. $-\frac{1}{1+x^2}, x \in R$

Choose the correct answer from the options given below.

(1) A-III, B-I, C-II, D-IV

(2) A-I, B-IV, C-III, D-II

(3) A-II, B-I, C-III, D-IV

(4) A-I, B-II, C-III, D-IV

27. If $y = A$ sin x $+B\cos x$, Where A and B are constants, then $\frac{d^2y}{dx^2}$ is equal to:

(1) y (2) $-y$

(3) x (4) $-x$

28. If $f(x) = \begin{cases} \frac{1-\cos 4x}{x^2}, & x \neq 0 \\ k, & x = 0 \end{cases}$ is continuous at $x - 0$, then the value of k is:

(1) 8 (2) 7

(3) 6 (4) 4

29. The slope of the normal to the curve $y = 2x^2 + 3\sin x$ at $x = 0$, is:

(1) 3 (2) -3

(3) $\frac{1}{3}$ (4) $-\frac{1}{3}$

30. If the function $f(x) - \frac{k\sin x + 2\cos x}{\sin x + \cos x}$ is increasing for all values of x, then

(1) $k < 1$ (2) $1 < k$

(3) $k > 2$ (4) $k < 2$

Answer Key									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
(1)	(1)	(3)	(4)	(3)	(2)	(3)	(3)	(2)	(2)
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
(2)	(4)	(2)	(2)	(4)	(2)	(3)	(3)	(1)	(2)
21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
(1)	(2)	(3)	(1)	(3)	(3)	(2)	(1)	(4)	(3)
31	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
(3)	(1)	(2)	(4)	(2)	(2)	(3)	(1)	(1)	(3)
41	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**
(2)	(2)	(1)	(3)	(2)	(1)	(3)	(2)	(4)	(3)
51	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**
(1)	(4)	(4)	(1)	(4)	(3)	(1)	(3)	(2)	(4)
61	**62**	**63**	**64**	**65**	**66**	**67**	**68**	**69**	**70**
(3)	(2)	(4)	(3)	(4)	(1)	(2)	(4)	(2)	(2)
71	**72**	**73**	**74**	**75**	**76**	**77**	**78**	**79**	**80**
(2)	(3)	(2)	(4)	(2)	(3)	(2)	(3)	(2)	(1)
81	**82**	**83**	**84**	**85**					
(3)	(4)	(2)	(4)	(2)					

EXPLANATION

1. Correct Answer is (1): We have to solve for,

$AB = I_3$

$$\begin{bmatrix}1 & 2 & x\\ 0 & 1 & 0\\ 0 & 0 & 1\end{bmatrix}\begin{bmatrix}1 & -2 & y\\ 0 & 1 & 0\\ 0 & 0 & 1\end{bmatrix} = \begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 0 & 0 & 1\end{bmatrix}$$

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

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

From the comparison, we see:

$y + x = 0$

$x + y = 0$

2. Correct Answer is (1): We are given the matrix A and the condition $A = A^{-1}$. This implies that $A \cdot A = I$, where I is the 2×2 identity matrix.

$$A^2 = A \cdot A = \begin{bmatrix}x & 1\\ 1 & 0\end{bmatrix} \cdot \begin{bmatrix}x & 1\\ 1 & 0\end{bmatrix}$$

$$A^2 = \begin{bmatrix}x^2+1 & x\\ x & 1\end{bmatrix}$$

Use the condition $A^2 = I$

$$\begin{bmatrix}x^2+1 & x\\ x & 1\end{bmatrix} = \begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$$

From this, we get two key equations:

1. $x^2 + 1 = 1 \Rightarrow x^2 = 0 \Rightarrow x = 0$
2. $x = 0$

3. Correct Answer is (3):

4. Correct Answer is (4):

Let the three points be,$(2, -3),\ (\lambda, -1),\ (0,4)$

$$\text{Area} = \frac{1}{2}|x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)|$$

Substitute these points into the formula:

$$\text{Area} = \frac{1}{2}\left|\begin{matrix}2((-1) - 4) + \lambda(4 - (-3)) + 0((-3)\\ -(-1))\end{matrix}\right|$$

$$\text{Area} = \frac{1}{2}|2(-5) + \lambda(7) + 0|$$

$$\text{Area} = \frac{1}{2}|-10 + 7\lambda|$$

For collinearity,

$|-10 + 7\lambda| = 0$

$-10 + 7\lambda = 0$

$7\lambda = 10$

$\lambda = \frac{10}{7}$

5. Correct Answer is (3):

We given,

$y = 10^{10^x}$

Differentiate using the chain rule,

$$\frac{dy}{dx} = \frac{d}{dx}\left(10^{10^x}\right)$$

Let $u = 10^x$, so $y = 10^u$. Using the chain rule:

$$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$$

1. Differentiate$y = 10^u$:

$$\frac{dy}{du} = 10^u \ln(10)$$

2. Differentiate$u = 10^x$:

$$\frac{du}{dx} = 10^x \ln(10)$$

Substitute $u = 10^x$ back:

$$\frac{dy}{dx} = 10^{10^x} \ln(10) \cdot 10^x \ln(10)$$

$$\frac{dy}{dx} = 10^{10^x} \cdot 10^x \cdot (\ln(10))^2$$

Since $\ln(10) = \log_{10} e$, we can write:

$$\frac{dy}{dx} = 10^{10^x} \cdot 10^x \cdot (\log_{10} 10)^2$$

6. Correct Answer is (2):

The equation of the parabola is:

$x^2 = 2y$

Differentiating both sides with respect to x:

$$2x = 2\frac{dy}{dx}$$

$$\frac{dy}{dx} = x$$

At $x = 1$, the slope of the tangent is:

$$\frac{dy}{dx} = 1$$

The slope of the tangent line is related to the angle θ it makes with the x-axis by:
slope $= \tan(\theta)$
Here, the slope is1, so:
$\tan(\theta) = 1$
$\theta = \tan^{-1} 1$
$\theta = 45^0$

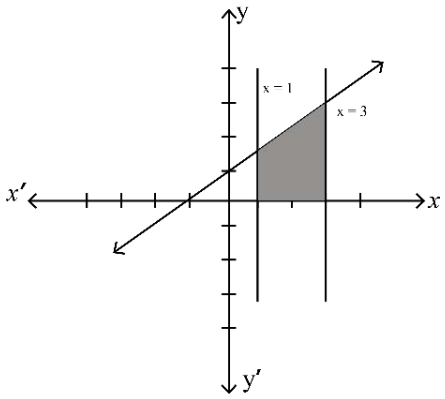
7. Correct Answer is (3): The function given is $f(x) = x^3$, defined for all real numbers ($x \in \mathbb{R}$).
To analyse the critical points of $f(x)$, compute the first derivative:
$f'(x) = 3x^2$
The derivative $f'(x) = 3x^2$ equals zero when $x = 0$, making $x = 0$ a critical point.
To determine whether $x = 0$ is a maximum, minimum, or neither, examine the second derivative:
$f''(x) = 6x$
At $x = 0$, the second derivative is:
$f''(0) = 6(0) = 0$
When the second derivative is zero, the nature of the critical point cannot be determined directly from the second derivative test. Instead, we examine the behaviour of $f(x)$ around $x = 0$:

1. For $x > 0$, $f'(x) = 3x^2 > 0$ (increasing function).
2. For $x < 0$, $f'(x) = 3x^2 > 0$ (also increasing).

Thus, $f(x)$ is increasing on both sides of $x = 0$. Therefore, $x = 0$ is neither a maximum nor a minimum. The function $f(x) = x^3$ has neither a maximum nor a minimum value at $x = 0$.

8. Correct Answer is (3):
Given:
$f(x) = \begin{cases} 2x + 8 & \text{for } 1 \le x \le 2, \\ 6x & \text{for } 2 < x < 4, \end{cases}$
The integral can be expressed as:
$\int_1^4 f(x)\,dx = \int_1^2 (2x + 8)\,dx + \int_2^4 6x\,dx$
Evaluate $\int_1^2 (2x + 8)\,dx$
$\int (2x + 8)\,dx = x^2 + 8x + C$
$\int_1^2 (2x + 8)\,dx = [x^2 + 8x]_1^2$
$= \big(2^2 + 8(2)\big) - \big(1^2 + 8(1)\big) = 20 - 9 = 11$
Evaluate $\int_2^4 6x\,dx$
$\int 6x\,dx = 3x^2 + C$
$\int_2^4 6x\,dx = [3x^2]_2^4 = 3(4^2) - 3(2^2) = 48 - 12 = 36$
Now,
$\int_1^4 f(x)\,dx = \int_1^2 (2x + 8)\,dx + \int_2^4 6x\,dx = 11 + 36$
$= 47$

9. Correct Answer is (2):



Given line is $2y - 5x + y$ and lines $x - 1$ *and* $x - 3$.
In the figure, the shaded region is our required region whose area has to be found.
When we slice the shaded region into vertical strips, we find that each vertical strip has its lower end on x-axis and upper end on the line $2y = 5x + 7$
So, approximating rectangle shown in figure has length =y and width=dx and area=ydx
The approximating rectangle can move from x=2 to x=8.
So, required is given by,
$A = \int_1^3 y dx$
$A = \int_1^3 \left(\frac{5x + 7}{2}\right) dx$
$A = \frac{1}{2}\int_1^3 (5x + 7) dx$
$A = \frac{1}{2}\left[\frac{5}{2}x^2 + 7x\right]_1^3$
$A = \frac{1}{2}\left[\frac{5}{2}(3)^2 + 7(3) - \frac{5}{2}(1)^2 + 7(1)\right]$
$A = \frac{1}{2}\left[\frac{5}{2} \times 9 + 21 - \frac{5}{2} + 7\right]$
$A = \frac{1}{2}\left[\frac{40}{2} + 18\right]$
$A = \frac{1}{2}\left[\frac{68}{2}\right]$
$A = 17$

10. Correct Answer is (2):

11. Correct Answer is (2): In the given equation:
$\frac{d^2y}{dx^2} = \left(1 + \frac{dy}{dx}\right)^{1/2}$
Taking square on both sides, we get

CUET UG MATHEMATICS MOCK TEST 1

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Medium **E**

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Note : Roll Number, Subject Code & Centre Code Should Be Filled In the Boxes Using The Pattern Given As :