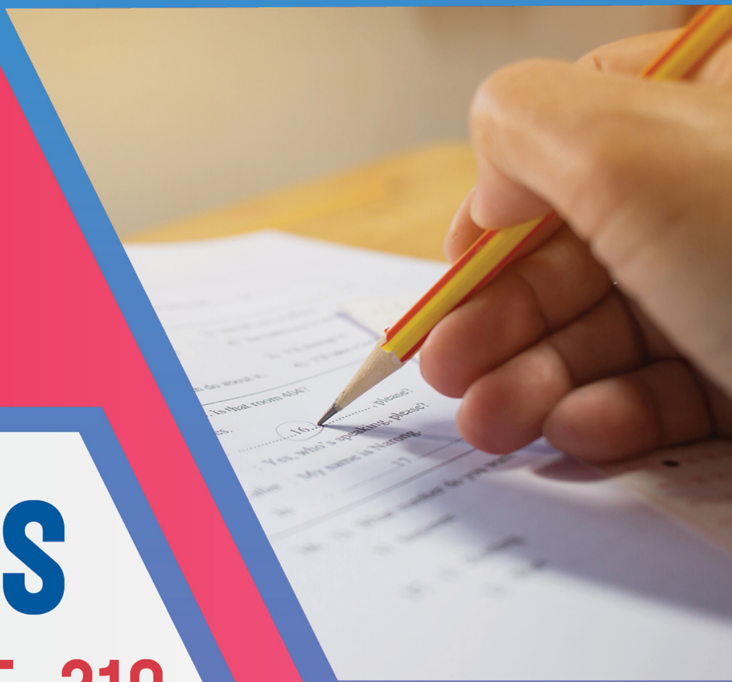
SAMPLE CONTENT

10 PRACTICE PAPER SET

IN ACCORDANCE WITH THE LATEST CUET (UG) PAPER CONDUCTED BY NATIONAL TESTING AGENCY



CUET (UG)

Common University Entrance Test

MATHEMATICS

Section - II A & II B1 CODE: 319

Features:

- Based on the notified syllabus prescribed by NTA
- Smart keys provided to crack questions efficiently
- Includes solved CUET (UG) 2022 question paper
- Covers a variety of questions:
  - Passage / Case - Study Based Questions
  - Statement Based Questions
  - Match the Columns

Target Publications® Pvt. Ltd.

For Common University Entrance Test CUET (UG) based on syllabus prescribed by
National Testing Agency (NTA)

10 PRACTICE PAPER SET

CUET (UG)

(Common University Entrance Test)

MATHEMATICS

Section - II (A & B1)

SALIENT FEATURES:

- Created as per the syllabus prescribed by **NTA**
- In accordance with the latest CUET (UG) Paper conducted by **NTA**
- Set of 10 full length Question Papers with Answers and Solutions
- Exhaustive coverage of all types of questions based on the latest CUET (UG) question paper
- **Smart Key** provided to crack questions efficiently
- Includes **Solved Question Paper** of CUET (UG) 2022, 17^{th} August (Slot - 1)

Sample Content

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PREFACE

The Common University Entrance Test, CUET (UG) is a crucial milestone for students as they progress towards their undergraduate education. It is the sole opportunity for them to gain admission into premier undergraduate institutions and courses after the completion of Class XII.

Target Publications, with more than a decade of experience and expertise in the domain of competitive examination, offers **'CUET (UG) 10 Practice Paper Set'** – Mathematics for CUET (UG) aspirants, which is a meticulously designed book to assess the threshold of knowledge imbibed by students.

This book charts out a compilation of 10 Practice Papers aimed at students appearing for the CUET (UG) examination. Every question paper in this book has been created in line with syllabus prescribed by NTA for CUET (UG) Mathematics.

Each paper covers various question types (***Passage/Case-Study Based Questions, Match the Columns, Statement Based Questions***) based on CUET (UG) - 2022 question paper and touches upon all the conceptual nodes of Mathematics. The questions throughout this book are specifically curated by our expert authors with an astute attention to detail. The core objective of this book is to gauge the student's preparedness to appear for CUET (UG) examination.

To aid students, ***Solutions*** are provided as deemed necessary. ***Smart Keys*** are provided selectively to encourage cracking a question efficiently by lateral thinking. ***Question paper of CUET (UG) 2022*** [17th August, 2022 (Slot - 1)] is provided along with solution to offer students a glimpse of the complexity of questions asked in entrance examination.

Apart from mastery on the subject content, we hope that this book will also help students to achieve objectives such as time-management and develop their ability to utilize the paper-pattern format (choice of questions to attempt) to their advantage in order to maximize their scores.

We hope that the book helps the learners as we have envisioned.

Publisher

Edition: First

The journey to create a complete book is strewn with triumphs, failures and near misses. If you think we've nearly missed something or want to applaud us for our triumphs, we'd love to hear from you.
Please write to us on: mail@targetpublications.org

Sample Content

Disclaimer

This reference book is based on the CUET (UG) official syllabus prescribed by National Testing Agency (NTA). We the publishers are making this reference book which constitutes as fair use of textual contents which are transformed by adding and elaborating, with a view to simplify the same to enable the students to understand, memorize and reproduce the same in examinations.

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Syllabus for CUET (UG) - Mathematics

SECTION - A

1. ALGEBRA

i. Matrices and types of Matrices
ii. Equality of Matrices, transpose of a Matrix, Symmetric and Skew Symmetric Matrix
iii. Algebra of Matrices
iv. Determinants
v. Inverse of a Matrix
vi. Solving of simultaneous equations using Matrix Method

2. CALCULUS

i. Higher order derivatives
ii. Tangents and Normals
iii. Increasing and Decreasing Functions
iv. Maxima and Minima

3. INTEGRATION AND ITS APPLICATIONS

i. Indefinite integrals of simple functions
ii. Evaluation of indefinite integrals
iii. Definite Integrals
iv. Application of Integration as area under the curve

4. DIFFERENTIAL EQUATIONS

i. Order and degree of differential equations
ii. Formulating and solving of differential equations with variable separable

5. PROBABILITY DISTRIBUTIONS

i. Random variables and its probability distribution
ii. Expected value of a random variable
iii. Variance and Standard Deviation of a random variable
iv. Binomial Distribution

6. LINEAR PROGRAMMING

i. Mathematical formulation of Linear Programming Problem
ii. Graphical method of solution for problems in two variables
iii. Feasible and infeasible regions
iv. Optimal feasible solution

SECTION - B1

UNIT I: RELATIONS AND FUNCTIONS

1. Relations and Functions

Types of relations: Reflexive, symmetric, transitive and equivalence relations. One to one and onto functions, composite functions, inverse of a function. Binary operations.

2. Inverse Trigonometric Functions

Definition, range, domain, principal value branches. Graphs of inverse trigonometric functions. Elementary properties of inverse trigonometric functions.

UNIT II: ALGEBRA

1. Matrices

Concept, notation, order, equality, types of matrices, zero matrix, transpose of a matrix, symmetric and skew symmetric matrices. Addition, multiplication and scalar multiplication of matrices, simple properties of addition, multiplication and scalar multiplication. Non-commutativity of multiplication of matrices and existence of non-zero matrices whose product is the zero matrix (restrict to square matrices of order 2). Concept of elementary row and column operations. Invertible matrices and proof of the uniqueness of inverse, if it exists; (Here all matrices will have real entries).

2. Determinants

Determinant of a square matrix (up to 3×3 matrices), properties of determinants, minors, cofactors and applications of determinants in finding the area of a triangle. Adjoint and inverse of a square matrix. Consistency, inconsistency and number of solutions of system of linear equations by examples, solving system of linear equations in two or three variables (having unique solution) using inverse of a matrix.

Sample Content

UNIT III: CALCULUS

1. Continuity and Differentiability

Continuity and differentiability, derivative of composite functions, chain rule, derivatives of inverse trigonometric functions, derivative of implicit function. Concepts of exponential, logarithmic functions. Derivatives of log x and e^x. Logarithmic differentiation. Derivative of functions expressed in parametric forms. Second-order derivatives. Rolle's and Lagrange's Mean Value Theorems (without proof) and their geometric interpretations.

2. Applications of Derivatives

Applications of derivatives: Rate of change, increasing/decreasing functions, tangents and normals, approximation, maxima and minima (first derivative test motivated geometrically and second derivative test given as a provable tool). Simple problems (that illustrate basic principles and understanding of the subject as well as real-life situations). Tangent and Normal.

3. Integrals

Integration as inverse process of differentiation. Integration of a variety of functions by substitution, by by partial fractions and by parts, only simple integrals of the type –

$$\int \frac{dx}{x^2 \pm a^2},\ \int \frac{dx}{\sqrt{x^2 \pm a^2}},\ \int \frac{dx}{\sqrt{a^2 - x^2}},\ \int \frac{dx}{ax^2 + bx + c},\ \int \frac{dx}{\sqrt{ax^2 + bx + c}},\ \int \frac{(px+q)}{ax^2 + bx + c} dx,\ \int \frac{(px+q)}{\sqrt{ax^2 + bx + c}} dx,\ \int \sqrt{a^2 \pm x^2}\, dx$$

and $\int \sqrt{x^2 - a^2}\, dx$, $\int \sqrt{ax^2 + bx + c}\, dx$ and $\int (px+q)\sqrt{ax^2 + bx + c}\, dx$ to be evaluated.

Definite integrals as a limit of a sum. Fundamental Theorem of Calculus (without proof). Basic properties of definite integrals and evaluation of definite integrals.

4. Application of Integrals

Applications in finding the area under simple curves, especially lines, arcs of circles/parabolas/ellipses (in standard form only), area between the two above said curves (the region should be clearly identifiable).

5. Differential Equations

Definition, order and degree, general and particular solutions of a differential equation. Formation of differential equation whose general solution is given. Solution of differential equations by method of separation of variables, homogeneous differential equations of first order and first degree. Solutions of linear differential equation of the type –

$\frac{dy}{dx} + Py = Q$, where P and Q are functions of x or constant

$\frac{dx}{dy} + Px = Q$, where P and Q are functions of y or constant

UNIT IV: VECTORS AND THREE-DIMENSIONAL GEOMETRY

1. Vectors

Vectors and scalars, magnitude and direction of a vector. Direction cosines/ratios of vectors. Types of vectors(equal, unit, zero, parallel and collinear vectors), position vector of a point, negative of a vector, components of a vector, addition of vectors, multiplication of a vector by a scalar, position vector of a point dividing a line segment in a given ratio. Scalar (dot) product of vectors, projection of a vector on a line. Vector (cross) product of vectors, scalar triple product.

2. Three-dimensional Geometry

Direction cosines/ratios of a line joining two points. Cartesian and vector equation of a line, Coplanar and skew lines, shortest distance between two lines. Cartesian and vector equation of a plane. Angle between (i) two lines, (ii) two planes, (iii) a line and a plane. Distance of a Point from a Plane

UNIT V: LINEAR PROGRAMMING

Introduction, related terminology such as constraints, objective function, optimization, different types of linear programming (L.P.) problems, mathematical formulation of L.P. problems, graphical method of solution for problems in two variables, feasible and infeasible regions, feasible and infeasible solutions, optimal feasible solutions (up to three non-trivial constrains)

UNIT VI: PROBABILITY

Multiplications theorem on probability. Conditional probability, independent events, total probability, Baye's theorem. Random variable and its probability distribution, mean and variance of haphazard variable.
Repeated independent (Bernoulli) trials and Binomial distribution.

Sample Content

Broad features of CUET (UG)

Mode of Examination: Computer Based Test (CBT) mode						
Sections	**Subjects/ Tests**	**Questions to be Attempted**	**Marks per Question**	**Total Marks**	**Question Type**	**Duration**
Section IA - Languages	There are 13 different languages. Any of these languages may be chosen.	40 questions out of 50 in each language	5	200	• Language to be tested through Reading Comprehension based on different types of passages– Factual, Literary and Narrative, [Literary Aptitude and Vocabulary] • MCQ Based Questions	45 Minutes for each language
Section IB - Languages	There are 20 Languages. Any other language apart from those offered in Section I A may be chosen.					
Section II - Domain	There are 27 Domains specific Subjects being offered under this Section. A candidate may choose a maximum of Six Domains as desired by the applicable University/ Universities.	40 questions out of 50 in each subject	5	200	• Input text can be used for MCQ Based Questions • MCQs based on syllabus given on NTA website	45 Minutes for each Domain Specific Subjects
Section III General Test	For any such undergraduate programme/ programmes being offered by Universities where a General Test is being used for admission.	60 questions out of 75	5	300	• Input text can be used for MCQ Based Questions • General Knowledge, Current Affairs, General Mental Ability, Numerical Ability, Quantitative Reasoning (Simple application of basic mathematical arithmetic/ algebra geometry/ mensuration /stat taught till Grade 8), Logical and Analytical Reasoning	60 Minutes
Note: • One mark will be deducted for a wrong answer. • Unanswered/Marked for Review will be given no mark (0).						

Candidates are advised to visit the NTA CUET (UG)-2022 official website ***https://cuet.samarth.ac.in/*** *for latest updates regarding the Examination.*

Note: In Section II, there are some Domain Specific Subjects which are multidisciplinary. In those subjects there will be two Sections, wherein Section A will be Compulsory for all. Section B may have more than one Sub Sections out of which a candidate can choose one or more than one Sections depending on the eligibility conditions of the Programme/ University they are applying for.

Mathematics Question Paper **(Section II)** will contain Two Sub-sections - Section A and Section B (B1 and B2, out of which only one Sub Section is to be attended.)

Section II-A will have 15 questions covering both i.e. Mathematics/Applied Mathematics which will be compulsory for all candidates.

Section II-B1 will have 35 questions from Mathematics out of which 25 questions need to be attempted.

Section II-B2 will have 35 questions purely from Applied Mathematics out of which 25 questions will be attempted.

In this book, we will be focusing on Section II-A and Section II-B1.

Sample Content

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PRACTICE PAPER – 01 MATHEMATICS

Time: 45 minutes **Total Marks: 200**

Instructions:

- *All questions from Section A are compulsory.*
- *Attempt any 25 questions from Section B1.*
- *Each question carries 5 marks.*
- *No mark will be given to unanswered/marked for review questions.*
- *Negative marking of 1 mark for a wrong answer.*

SECTION - A

1. If $\begin{bmatrix} 2 & -3 \\ 7 & -4 \\ 9 & 0 \end{bmatrix} + \begin{bmatrix} 3 & x \\ 5 & 4 \\ y & 3 \end{bmatrix} = \begin{bmatrix} 5 & 2 \\ 12 & 0 \\ 11 & 3 \end{bmatrix}$, then $x + y =$ is

(A) 5 (B) 7
(C) 9 (D) 12

2. A random variable X has the following probability distribution:

X	1	2	3	4
P(X)	$\frac{1}{7}$	$\frac{2}{7}$	$\frac{3}{7}$	$\frac{1}{7}$

Then, the variance of this distribution is

(A) $\frac{49}{40}$ (B) $\frac{40}{49}$
(C) $\frac{20}{29}$ (D) $\frac{29}{20}$

3. If $A = \begin{bmatrix} 4 & k & k \\ 0 & k & k \\ 0 & 0 & k \end{bmatrix}$ and det (A) = 256, then |k| equals

(A) 4 (B) 5
(C) 6 (D) 8

4. $\int \frac{x-1}{(x+1)^2}\,dx =$

(A) $\log|x + 1| + \frac{2}{x+1} + c$

(B) $\log|x + 1| - \frac{2}{x+1} + c$

(C) $\frac{2}{x+1} - \log|x + 1| + c$

(D) $2\log|x + 1| - \frac{1}{x+1} + c$

5. The abscissae of the points, where the tangent to curve $y = x^3 - 3x^2 - 9x + 5$ is parallel to X- axis, are

(A) $x = 0$ and 1
(B) $x = 1$ and -1
(C) $x = 1$ and -3
(D) $x = -1$ and 3

6. If $x = 2at^2$, $y = at^4$, then $\frac{d^2y}{dx^2}$ at t = 2 is

(A) 4 (B) 2a
(C) $\frac{1}{2a}$ (D) $-\frac{1}{2a}$

7. **Statement I:** The degree and the order of the differential equation $\frac{d^2y}{dx^2} = \sqrt[3]{1+\left(\frac{dy}{dx}\right)^2}$ are 3 and 2 respectively.

Statement II: The order of a differential equation is the order of the highest order derivative occuring in it.

(A) Both Statement I and Statement II are correct.
(B) Both Statement I and Statement II are incorrect.
(C) Statement I is correct but Statement II is incorrect.
(D) Statement I is incorrect but Statement II is correct.

8. If x and y are two positive numbers such that $x + y = 32$, then the minimum value of $x^2 + y^2$ is

(A) 500 (B) 256
(C) 1024 (D) 512

9. If the probability that a student is not a swimmer is $\frac{1}{5}$, then the probability that out of 5 students one is swimmer is

(A) ${}^5C_1\left(\frac{4}{5}\right)^4\left(\frac{1}{5}\right)$ (B) ${}^5C_1\left(\frac{4}{5}\right)\left(\frac{1}{5}\right)^4$
(C) $\frac{4}{5}\left(\frac{1}{5}\right)^4$ (D) $5\left(\frac{4}{5}\right)^5\left(\frac{1}{5}\right)$

10. If $A = \begin{bmatrix} 2 & -2 \\ -2 & 2 \end{bmatrix}$, then $A^n = 2^k A$, where k =

(A) 2^{n-1} (B) n + 1
(C) n – 1 (D) 2(n – 1)

11. If $f(x) = \frac{x}{x^2+1}$ is increasing function, then the value of x lies in

(A) R (B) $(-\infty, -1)$
(C) $(1, \infty)$ (D) $(-1, 1)$

Sample Content

12. Let $f(x) = \begin{vmatrix} 0 & x & 16 \\ x & 5 & 7 \\ 0 & 9 & x \end{vmatrix}$. If $x = 0$ is a root of $f(x) = 0$, then the other roots are

(A) 12, 12 (B) 12, –12
(C) 12, 16 (D) 9, 16

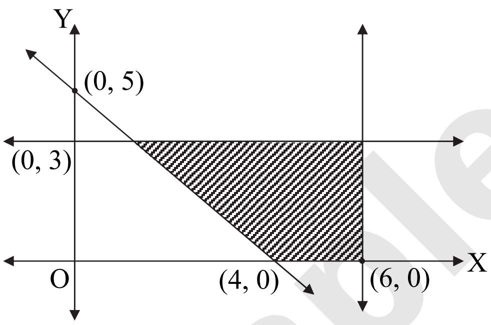
13. The value of $\int_1^{e^2} \frac{dx}{x(1+\log x)^2}$ is

(A) $\frac{2}{3}$ (B) $\frac{1}{3}$
(C) $\frac{3}{2}$ (D) $\frac{1}{2}$

14. The differential equation representing the family of parabolas having vertex at origin and axis along positive direction of X-axis is

(A) $y^2 - 2xy\frac{dy}{dx} = 0$ (B) $y^2 + 2xy\frac{dy}{dx} = 0$
(C) $y^2 - 2xy\frac{d^2y}{dx^2} = 0$ (D) $y^2 + 2xy\frac{d^2y}{dx^2} = 0$

15. The shaded region in the figure is the solution set of the inequations



(A) $5x + 4y \geq 20, x \leq 6, y \geq 3, x \geq 0, y \geq 0$
(B) $5x + 4y \leq 20, x \leq 6, y \leq 3, x \geq 0, y \geq 0$
(C) $5x + 4y \geq 20, x \leq 6, y \leq 3, x \geq 0, y \geq 0$
(D) $5x + 4y \geq 20, x \geq 6, y \leq 3, x \geq 0, y \geq 0$

SECTION - B1

16. The relation ">" in the set of N (Natural numbers) is

(A) symmetric
(B) reflexive
(C) transitive
(D) equivalence relation

17. A spherical balloon is being inflated at the rate of 35 cc/min. The rate of increase of the surface area of the balloon when its diameter is 14 cm is

(A) 7 cm^2/min (B) 10 cm^2/min
(C) 17.5 cm^2/min (D) 28 cm^2/min

18. If the lines $\frac{x-2}{1} = \frac{y-4}{4} = \frac{z-6}{k}$ and $\frac{x+1}{3} = \frac{y+3}{5} = \frac{z+5}{k}$ are coplanar, then the value of k is

(A) 7 (B) 3
(C) –3 (D) –7

19. If $|\vec{a} - \vec{b}| = |\vec{a}| = |\vec{b}| = 1$, then the angle between $\vec{a}$ and $\vec{b}$ is

(A) $\frac{\pi}{3}$ (B) $\frac{3\pi}{4}$
(C) $\frac{\pi}{2}$ (D) 0

20. If $f(x) = |x| + |x-1|$, then

(A) $f(x)$ is continuous at $x = 0$ only
(B) $f(x)$ is continuous at $x = 1$ only
(C) $f(x)$ is continuous at both $x = 0$ and $x = 1$
(D) $f(x)$ is discontinuous

21. The area bounded by the parabola $y = 4x^2$, Y-axis and the lines $y = 1$, $y = 4$ in first quadrant is

(A) 3 sq. units (B) $\frac{7}{5}$ sq. units
(C) $\frac{7}{3}$ sq. units (D) $\frac{8}{3}$ sq. units

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

(A) $|1 + x^2|\, |1 + e^{2y}| = c$
(B) $(\tan^{-1}x)^2 + 2\log|1 + y^2| = c$
(C) $\tan^{-1}x + \log|1 + y^2| = c$
(D) $\frac{1}{2}(\tan^{-1}x)^2 + 2\log|1 + y^2| = c$

23. $\tan\left(\cos^{-1}\frac{3}{5} + \tan^{-1}\frac{1}{4}\right) =$

(A) $\frac{4}{5}$ (B) $\frac{8}{19}$
(C) $\frac{19}{8}$ (D) $\frac{19}{12}$

24. The approximate value of $(255)^{\frac{1}{4}}$ is

(A) 3.1969 (B) 3.9961
(C) 3.6691 (D) 3.9196

25. If three points A, B, C are collinear, whose position vectors are $\hat{i} - 2\hat{j} - 8\hat{k}$, $5\hat{i} - 2\hat{k}$ and $11\hat{i} + 3\hat{j} + 7\hat{k}$ respectively, then the ratio in which B divides AC is

(A) 1 : 2 (B) 2 : 3
(C) 2 : 1 (D) 1 : 1

Sample Content

26. If A and B are two events such that $A \subseteq B$, then $P(B \mid A) =$

(A) 0 (B) 1

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

27. Shortest distance between lines $\frac{x-3}{1}=\frac{y-5}{-2}=\frac{z-7}{1}$ and $\frac{x+1}{7}=\frac{y+1}{-6}=\frac{z+1}{1}$ is

(A) $\sqrt{29}$ (B) $2\sqrt{29}$

(C) $3\sqrt{29}$ (D) $5\sqrt{29}$

28. If $f(x) = \sin x + \cos x,\ x \in(-\infty, \infty)$ and $g(x) = x^2,\ x \in (-\infty,\infty)$, then $(fog)(x)$ is equal to

(A) 1 (B) 0

(C) $\sin^2(x) + \cos(x^2)$ (D) $\sin(x^2) + \cos(x^2)$

29. A man is known to speak the truth 3 out of 4 times. He throws a die and reports that it is a six. The probability that it is actually a six, is

(A) $\frac{3}{8}$ (B) $\frac{1}{5}$ (C) $\frac{3}{4}$ (D) $\frac{1}{4}$

30. If $\vec{p}=\hat{i}+\hat{j}, \vec{q}=4\hat{k}-\hat{j}$ and $\vec{r}=\hat{i}+\hat{k}$, then the unit vector in the direction of $3\vec{p}+\vec{q}-2\vec{r}$ is

(A) $\frac{1}{3}(\hat{i}+2\hat{j}+2\hat{k})$ (B) $\frac{1}{3}(\hat{i}-2\hat{j}-2\hat{k})$

(C) $\frac{1}{3}(\hat{i}-2\hat{j}+2\hat{k})$ (D) $\hat{i}+2\hat{j}+2\hat{k}$

31. If $y = \sec x°$, then $\frac{dy}{dx} =$

(A) $\sec x \tan x$ (B) $\sec x° \tan x°$

(C) $\frac{\pi}{180} \sec x° \tan x°$ (D) $\frac{180}{\pi} \sec x° \tan x°$

32. Two events A and B will be independent if

(A) A and B are mutually exclusive

(B) $P(A' \cap B') = (1 - P(A))\,(1 - P(B))$

(C) $P(A) = P(B)$

(D) $P(A) + P(B) = 1$

33. If $\frac{1}{\sqrt{2}} \le x \le 1$ and $\sin^{-1}\left(2x\sqrt{1-x^2}\right) = A + B \sin^{-1} x$, then $(A, B) =$

(A) $(\pi, 2)$ (B) $(0, 2)$

(C) $(\pi, -2)$ (D) $(0, -2)$

34. If $f(x) = \begin{cases} \frac{\sqrt{1+kx}-\sqrt{1-kx}}{x}, & -1 \le x < 0 \\ \frac{2x+1}{x-1}, & 0 \le x \le 1 \end{cases}$

is continuous at $x = 0$, then

(A) $k = 1$ (B) $k = -1$

(C) $k = 0$ (D) $k = 2$

35. If A is a singular matrix, then adj A is

(A) singular (B) non-singular

(C) symmetric (D) not defined

36. If $f : Z \to Z$ defined by $f(x) = x^2$, then f is

(A) one-one and onto

(B) one-one and not onto

(C) onto and not one

(D) neither one-one nor onto

37. The equation of the plane passing through the intersection of the planes $x + 2y + 3z + 4 = 0$ and $4x + 3y + 2z + 1 = 0$ and the origin is

(A) $3x + 2y + z + 1 = 0$

(B) $3x + 2y + z = 0$

(C) $2x + 3y + z = 0$

(D) $x + y + z = 0$

38. Match List – I with List – II.

	List – I		**List – II**
i.	$\begin{bmatrix} 0 & 4 & 5 \\ -4 & 0 & -6 \\ -5 & 6 & 0 \end{bmatrix}$	a.	Symmetric matrix
ii.	$\begin{bmatrix} 5 \\ 4 \\ -3 \end{bmatrix}$	b.	Row matrix
iii.	$\begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$	c.	Skew-Symmetric matrix
iv.	$\begin{bmatrix} -2 & 1 & 0 \end{bmatrix}$	d.	Column matrix

Choose the correct answer from the options given below:

	i.	ii.	iii.	iv.
(A)	d	a	c	b
(B)	c	d	a	b
(C)	b	a	d	c
(D)	c	d	b	a

39. If $\sin^{-1}x = y$, then

(A) $0 < y < \pi$ (B) $-\frac{\pi}{2} < y < \frac{\pi}{2}$

(C) $0 \le y \le \pi$ (D) $-\frac{\pi}{2} \le y \le \frac{\pi}{2}$

40. If $x^y = e^{x-y}$, then $\frac{dy}{dx}$ is equal to

(A) $\frac{e^x}{x^{x-y}}$ (B) $\frac{1}{y}-\frac{1}{x-y}$

(C) $\frac{\log x}{\log(x-y)}$ (D) $\frac{\log x}{(1+\log x)^2}$

Sample Content

Read the following passage and answer the questions from 41 to 45.

Three paratha outlets P, Q and R sell three types of parathas namely Potato, Onion and Green Peas paratha. In a day, P can sell 28 Potato parathas, 21 Onion parathas and 14 Green Peas parathas; Q can sell 14 Potato parathas, 28 Onion parathas and 42 Green Peas parathas; R can sell 42 Potato parathas, 14 Onion parathas and 21 Green Peas parathas. The revenue generated in a day by P is ₹ 4200, by Q is ₹ 6300 and by R is ₹ 4900. If x denotes selling price of Potato paratha, y is selling price of Onion paratha and z is the selling price of Green Peas paratha, then based on this information, answer the following questions:

41. The total revenue generated by three outlets P, Q and R are:

(A) ₹ 7,700 (B) ₹ 10,500
(C) ₹ 15,400 (D) ₹ 18,500

42. The matrix representation of the above problem is:

(A) $\begin{bmatrix} 4 & 2 & 6 \\ 3 & 4 & 2 \\ 2 & 6 & 3 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 600 \\ 900 \\ 700 \end{bmatrix}$

(B) $\begin{bmatrix} 4 & 3 & 2 \\ 2 & 4 & 6 \\ 6 & 2 & 3 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 600 \\ 900 \\ 700 \end{bmatrix}$

(C) $\begin{bmatrix} 4 & 3 & 2 \\ 1 & 2 & 3 \\ 6 & 2 & 3 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 600 \\ 450 \\ 700 \end{bmatrix}$

(D) $\begin{bmatrix} 4 & 2 & 6 \\ 3 & 4 & 2 \\ 2 & 6 & 3 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 6000 \\ 9000 \\ 7000 \end{bmatrix}$

43. The price of 5 Potato parathas is:

(A) ₹ 50 (B) ₹ 250
(C) ₹ 450 (D) ₹ 750

44. The price of 3 Onion parathas is:

(A) ₹ 80 (B) ₹ 160
(C) ₹ 240 (D) ₹ 320

45. If the cost price of a Potato paratha is ₹ 30, an Onion paratha is ₹ 50 and a Green Peas paratha is ₹ 50, what is the profit of outlet Q in a day?

(A) ₹ 2050 (B) ₹ 2380
(C) ₹ 3205 (D) ₹ 4250

Read the following passage and answer the questions from 46 to 50.

To solve the integrals of the type $\int_{-a}^{a} f(x)dx$, we apply the following rule.

$$\int_{-a}^{a} f(x)dx = \begin{cases} 2\int_{0}^{a} f(x)dx, & \text{if } f(x) \text{ is an even function} \\ & \text{i.e. } f(-x) = f(x) \\ 0, & \text{if } f(x) \text{ is an odd function} \\ & \text{i.e. } f(-x) = -f(x) \end{cases}$$

Based on the above information, answer the following questions.

46. $f(x) = x^4 \sin x$ is

(A) an odd function
(B) an even function
(C) neither even nor odd
(D) none of these

47. $\int_{-\frac{\pi}{4}}^{\frac{\pi}{4}} f(x)dx =$

(A) π (B) $\frac{\pi}{2}$
(C) $\frac{\pi}{4}$ (D) 0

48. $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin^2 x\,dx =$

(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{2}$
(C) $\frac{\pi}{4}$ (D) $\frac{\pi}{3}$

49. If $g(x) = \sin |x|$, then $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} g(x)dx =$

(A) 0 (B) 1
(C) 2 (D) 3

50. $\int_{-\pi}^{\pi} \sin^5 x\,dx =$

(A) $\frac{\pi}{6}$ (B) 0
(C) $\frac{\pi}{3}$ (D) $\frac{\pi}{2}$

Sample Content

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Practice Paper – 01

1. **(B)**

$$\begin{bmatrix} 2 & -3 \\ 7 & -4 \\ 9 & 0 \end{bmatrix} + \begin{bmatrix} 3 & x \\ 5 & 4 \\ y & 3 \end{bmatrix} = \begin{bmatrix} 5 & 2 \\ 12 & 0 \\ 11 & 3 \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} 5 & -3+x \\ 12 & 0 \\ 9+y & 3 \end{bmatrix} = \begin{bmatrix} 5 & 2 \\ 12 & 0 \\ 11 & 3 \end{bmatrix}$$

$\Rightarrow -3 + x = 2 \Rightarrow x = 5$

and $9 + y = 11 \Rightarrow y = 2$

$\therefore \quad x + y = 7$

2. **(B)**

$E(X) = \sum x_i . P(x_i)$

$= 1\left(\frac{1}{7}\right) + 2\left(\frac{2}{7}\right) + 3\left(\frac{3}{7}\right) + 4\left(\frac{1}{7}\right)$

$= \frac{18}{7}$

$E(X^2) = (1^2)\left(\frac{1}{7}\right) + (2^2)\left(\frac{2}{7}\right) + (3^2)\left(\frac{3}{7}\right) + (4^2)\left(\frac{1}{7}\right)$

$= \frac{1}{7} + \frac{8}{7} + \frac{27}{7} + \frac{16}{7} = \frac{52}{7}$

$\therefore \quad Var(X) = E(X^2) - [E(X)]^2$

$= \frac{52}{7} - \left(\frac{18}{7}\right)^2$

$= \frac{40}{49}$

3. **(D)**

$$|A| = \begin{vmatrix} 4 & k & k \\ 0 & k & k \\ 0 & 0 & k \end{vmatrix}$$

$\therefore \quad |A| = 4\,(k^2)$

$\Rightarrow 256 = 4\,k^2$

$\Rightarrow k = \pm 8$

$\Rightarrow |k| = 8$

4. **(A)**

$\int \frac{x-1}{(x+1)^2} dx = \int \frac{x+1-2}{(x+1)^2} dx$

$= \int \frac{1}{x+1} dx - \int \frac{2}{(x+1)^2} dx$

$= \log|x+1| + \frac{2}{(x+1)} + c$

5. **(D)**

$y = x^3 - 3x^2 - 9x + 5 \Rightarrow \frac{dy}{dx} = 3x^2 - 6x - 9$

Since the tangent is parallel to X-axis, $\frac{dy}{dx} = 0$

$\Rightarrow 3x^2 - 6x - 9 = 0 \Rightarrow x = -1, 3$

6. **(C)**

$x = 2at^2$ and $y = at^4$

$\therefore \quad \frac{dx}{dt} = 4at$ and $\frac{dy}{dt} = 4at^3$

$\therefore \quad \frac{dy}{dx} = \frac{\frac{dy}{dt}}{\frac{dx}{dt}} = t^2$

$\therefore \quad \frac{d^2y}{dx^2} = 2t.\frac{dt}{dx} = 2t.\frac{1}{4at} = \frac{1}{2a}$

$\therefore \quad \left(\frac{d^2y}{dx^2}\right)_{(t=2)} = \frac{1}{2a}$

7. **(A)**

$\frac{d^2y}{dx^2} = \sqrt[3]{1 + \left(\frac{dy}{dx}\right)^2}$

$\Rightarrow \left(\frac{d^2y}{dx^2}\right)^3 = 1 + \left(\frac{dy}{dx}\right)^2$

Here, the highest order derivative is $\frac{d^2y}{dx^2}$ with power 3.

$\therefore$ Order = 2 and degree = 3

8. **(D)**

$x + y = 32 \Rightarrow y = 32 - x$

$\Rightarrow x^2 + y^2 = x^2 + (32 - x)^2$

Let $f(x) = x^2 + (32 - x)^2$

$\Rightarrow f'(x) = 2x + 2(32 - x)(-1)$

$= 4x - 64$

For maximum or minimum of $f(x)$,

$f'(x) = 0$

$\Rightarrow 4x - 64 = 0 \Rightarrow x = 16$

$\therefore$ $f(x)$ is minimum at $x = 16$.

Now, $f''(x) = 4 > 0$

$\therefore$ Minimum value $= x^2 + y^2 = (16)^2 + (16)^2 = 512$

9. **(B)**

Here, $q = \frac{1}{5}$

$\therefore \quad p = 1 - \frac{1}{5} = \frac{4}{5}$

Also, $n = 5$

$\therefore$ Required probability $= P(X = 1)$

$= {}^5C_1\left(\frac{4}{5}\right)\left(\frac{1}{5}\right)^4$

Smaple Content

10. **(D)**

$A = \begin{bmatrix} 2 & -2 \\ -2 & 2 \end{bmatrix}$

$\therefore \quad A^2 = \begin{bmatrix} 2 & -2 \\ -2 & 2 \end{bmatrix}\begin{bmatrix} 2 & -2 \\ -2 & 2 \end{bmatrix} = \begin{bmatrix} 8 & -8 \\ -8 & 8 \end{bmatrix} = 4A$

$\therefore \quad A^2 = 2^2\,A$ …(i)

$A^3 = A^2 . A = 4A . A = 4A^2 = 4\,(4A) = 16\,A$

$\therefore \quad A^3 = 2^4\,A$ …(ii)

$A^4 = A^3 . A = 16A . A = 16A^2 = 16\,(4A) = 64\,A$

$\therefore \quad A^4 = 2^6\,A$ …(iii)

$A^n = 2^k . A$ …(iv)[Given]

From (i), (ii), (iii) and (iv), we can conclude that

$k = 2\,(n - 1)$

11. **(D)**

$f(x) = \dfrac{x}{x^2+1}$

$\therefore \quad f'(x) = \dfrac{(x^2+1)(1) - x(2x)}{(x^2+1)^2} = \dfrac{1-x^2}{(x^2+1)^2}$

For f(x) to be increasing,

$f'(x) > 0$

$\Rightarrow \dfrac{1-x^2}{(x^2+1)^2} > 0$

$\Rightarrow 1 - x^2 > 0$ …$[\,(x^2+1)^2 \neq 0]$

$\Rightarrow x^2 < 1$

$\Rightarrow x \in (-1, 1)$

12. **(B)**

$\begin{vmatrix} 0 & x & 16 \\ x & 5 & 7 \\ 0 & 9 & x \end{vmatrix} = 0$

$\Rightarrow -x\,(x^2) + 16\,(9x) = 0$

$\Rightarrow -x\,(x^2 - 144) = 0$

$\Rightarrow x = 0$ or $x^2 = 144$

$\Rightarrow x = \pm\,12$

$\therefore$ The other two roots are 12, –12.

13. **(A)**

Let $I = \displaystyle\int_1^{e^2} \frac{dx}{x(1+\log x)^2}$

Put $(1 + \log x) = t \Rightarrow \dfrac{1}{x}\,dx = dt$

When $x = 1$, t = 1 and when $x = e^2$, t = 3

$\therefore \quad I = \displaystyle\int_1^3 \frac{dt}{t^2} = \left[\frac{-1}{t}\right]_1^3 = -\left(\frac{1}{3} - 1\right) = \frac{2}{3}$

14. **(A)**

The differential equation representing the family of parabolas having vertex at origin and axis along positive direction of X-axis is

$y^2 = 4ax$ …(i)

Differentiating w.r.t. x, we get

$2y\dfrac{dy}{dx} = 4a$

$\Rightarrow 2y\dfrac{dy}{dx} = \dfrac{y^2}{x}$ …[From (i)]

$\Rightarrow 2yx\dfrac{dy}{dx} = y^2$

$\Rightarrow y^2 - 2xy\dfrac{dy}{dx} = 0$

15. **(C)**

Shaded region lies on non-origin side of $5x + 4y = 20$, and on origin side of the lines $x = 6$ and $y = 3$.

$\therefore \quad 5x + 4y \geq 20,\ x \leq 6,\ y \leq 3,\ x \geq 0,\ y \geq 0$

16. **(C)**

For any $a \in N$, $a \not> a$

$\therefore$ > is not reflexive.

For any $a, b \in N$, if a > b, then $b \not> a$.

$\therefore$ > is not symmetric.

For any $a, b, c \in N$, if a > b and b > c, then a > c

$\therefore$ > is transitive.

17. **(B)**

Volume = $V = \dfrac{4}{3}\pi r^3$

$\Rightarrow \dfrac{dV}{dt} = 4\pi r^2 . \dfrac{dr}{dt}$

Here, $r = \dfrac{14}{2} = 7$ cm and $\dfrac{dV}{dt} = 35$ cc/min

$\Rightarrow 35 = 4\pi(7)^2 \dfrac{dr}{dt} \Rightarrow \dfrac{dr}{dt} = \dfrac{5}{28\pi}$

Surface area, $S = 4\pi r^2$

$\therefore \quad \dfrac{dS}{dt} = 8\pi r\dfrac{dr}{dt} = 8\pi(7)\left(\dfrac{5}{28\pi}\right) = 10\ \text{cm}^2/\text{min}$

18. **(A)**

If the lines $\dfrac{x-x_1}{a_1} = \dfrac{y-y_1}{b_1} = \dfrac{z-z_1}{c_1}$ and $\dfrac{x-x_2}{a_2} = \dfrac{y-y_2}{b_2} = \dfrac{z-z_2}{c_2}$ are coplanar, then

$\begin{vmatrix} x_2-x_1 & y_2-y_1 & z_2-z_1 \\ a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \end{vmatrix} = 0$

The given lines are coplanar.

$\therefore \quad \begin{vmatrix} -1-2 & -3-4 & -5-6 \\ 1 & 4 & k \\ 3 & 5 & k \end{vmatrix} = 0$

$\Rightarrow -3(4k - 5k) + 7(k - 3k) - 11(-7) = 0$

$\Rightarrow k = 7$

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CUET (UG) - 2022 Question Paper

17th August 2022 (Slot - 1)

Note:

- *All questions from section A are compulsory.*
- *Attempt any 25 questions from section B1.*

SECTION - A

1. If $x = 2at$, $y = at^2$, then $\frac{d^2y}{dx^2}$ is:
   (A) 1 (B) $\frac{1}{2a}$
   (C) t (D) 0

2. A die is thrown once. If E is the event that 'the number appearing is a multiple of 3' and F be the event 'the number appearing is even', then the incorrect option is
   (A) $P(E) = \frac{1}{3}$
   (B) $P(F) = \frac{1}{2}$
   (C) $P(E \cap F) = \frac{1}{6}$
   (D) E and F are dependent events

3. Ten eggs are drawn successively with replacement from a lot containing 10% defective eggs. The probability that there is at least one defective egg is:
   (A) $\frac{10^{10} - 9^{10}}{10^{10}}$ (B) $\frac{9^{10} - 10^{10}}{10^{10}}$
   (C) $\frac{10^{9} - 9^{10}}{10^{10}}$ (D) $\frac{10^{10} + 9^{10}}{10^{10}}$

4. If m is the degree and n is the order of the given differential equation
$$\frac{x^3\left(\frac{d^3y}{dx^3}\right)^2 + 2x^2\left(\frac{d^2y}{dx^2}\right)^3}{(x+1)^5} = \left(3x - \frac{d^2y}{dx^2}\right)^4$$
   (A) m – n = 2
   (B) m + n = 5
   (C) m = 4, n = 3
   (D) Order (n) is 3 but degree (m) is not defined

5. The differential equation representing the family of curves $y = m(x - d)$ where m and d are arbitrary constants, is:
   (A) $\frac{dy}{dx} = 0$ (B) $\frac{d^2y}{dx^2} = 0$
   (C) $x\frac{d^2y}{dx^2} + y = 0$ (D) $x\frac{d^2y}{dx^2} - y = 0$

6. $\int_1^2 \frac{dx}{x(x^4+1)} = ?$
   (A) $\log\left(\frac{32}{17}\right)$ (B) $\log\left(\frac{16}{17}\right)$
   (C) $\frac{1}{4}\log\left(\frac{16}{17}\right)$ (D) $\frac{1}{4}\log\left(\frac{32}{17}\right)$

7. If the area of the region in first quadrant, bounded by the curve $y^2 = 9x$, $x = 2$, $x = 4$ and x-axis is $a + b\sqrt{2}$, then the value of a + b is:
   (A) 16 (B) 12
   (C) 20 (D) 8

8. If $\begin{bmatrix} x+y+z \\ x+z \\ y+z \end{bmatrix} = \begin{bmatrix} 11 \\ 6 \\ 8 \end{bmatrix}$, then the value of $x + 2y - 3z$ is:
   (A) 5 (B) 4
   (C) 3 (D) 7

9. If $x = 3t^2 + 5t + 6$ and $y = -4t^3 - 2t^2 + 5t + 7$, $t \neq \frac{-5}{6}$ then the value of $\frac{dy}{dx}$ is:
   (A) $-2t + 1$
   (B) $\frac{-12t^2 - 4t - 5}{6t + 5}$
   (C) $\frac{-4t^3 - 2t^2 + 5t + 7}{3t^2 + 5t + 6}$
   (D) $\frac{-4t^3 - 2t^2 + 5t + 7}{6t + 5}$

10. The interval in which the function f given by $f(x) = x^2 - 4x + 6$ is strictly increasing is
    (A) $(-\infty, 2)$ (B) $(-\infty, -2)$
    (C) $(2, \infty)$ (D) $(-2, \infty)$

11. If $y = \log_e\left(\frac{2x}{1-x}\right)$, then $\frac{d^2y}{dx^2}$ at $x = \frac{1}{2}$ is:
    (A) $\frac{1}{2}$ (B) $\frac{1}{4}$
    (C) 0 (D) $\frac{3}{5}$

Sample Content

12. If a, b, c are mutually unequal real numbers, then the value of $\dfrac{\begin{vmatrix} 1 & a & a^3 \\ 1 & b & b^3 \\ 1 & c & c^3 \end{vmatrix}}{\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix}} =$

(A) $-(a + b + c)$ (B) $a + b + c$
(C) $a^2 + b^2 + c^2$ (D) $a^3 + b^3 + c^3$

13. If $A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ and $n \in N$ (where N is the set of natural numbers), then A^n is equal

(A) nA (B) 2 nA
(C) $2^{n-1} A$ (D) $2^n A$

14. If $y = \dfrac{1}{\sqrt{1+x^2} - x}$, then the value of $\left(1+x^2\right)^{\frac{3}{2}}$, $\dfrac{d^2y}{dx^2}$ is:

(A) x (B) $x^2 - 1$
(C) $\sqrt{1+x^2} - 1$ (D) 1

15. The equation of the tangent to the curve $y = x^2 - 2x + 7$, which is parallel to the line $2x - y + 9 = 0$, is:

(A) $2x - y + 3 = 0$ (B) $2x - y + 6 = 0$
(C) $2x - y + 1 = 0$ (D) $2x - y + 4 = 0$

SECTION - B1

16. Consider the non-empty set consisting of children in a family and a relation R defined as aRb if a is brother of b. Then R is:

(A) Symmetric but not transitive
(B) Transitive but not symmetric
(C) Neither symmetric nor transitive
(D) Both symmetric and transitive

17. The relation R in the set {1, 2, 3} given by R = {(1, 1), (2, 2), (3, 3), (1, 2), (2, 3)} is:

(A) Reflexive only
(B) Reflexive and symmetry relation
(C) Transitive only
(D) Equivalence relation

18. If $f : R - \{-1\} \to R - \{1\}$ be a function defined by $f(x) = \dfrac{x-1}{x+1}$, then:

i. f is one-one but not onto.
ii. f is onto but not one-one.
iii. f is one-one and onto.
iv. $f^{-1}(x) = \dfrac{x+1}{x-1}$
v. $(fof)(x) = -\dfrac{1}{x}$; $x \neq 0, -1$

(A) i, iv, v only (B) iii, iv only
(C) ii, v only (D) iii, v only

19. The domain of the function $\cos^{-1}(2x - 1)$ is:

(A) [0, 1] (B) [–1, 1]
(C) (–1, 1) (D) [0, π]

20. $\tan^{-1}\left(\dfrac{x}{y}\right) - \tan^{-1}\left(\dfrac{x-y}{x+y}\right) =$

(A) $\dfrac{\pi}{6}$ (B) $\dfrac{\pi}{3}$
(C) $\dfrac{\pi}{4}$ (D) $\dfrac{\pi}{2}$

21. If the matrix $A = \begin{bmatrix} 3 & 2a & -5 \\ -4 & 0 & b \\ -5 & 3 & 7 \end{bmatrix}$ is symmetric then the value of (a + b) is:

(A) 1 (B) 5
(C) 3 (D) 4

22. If A is square matrix of size 4 and |A| = 6. If |Adj. (Adj. 3A)| = $2^a.3^b$, then value of a + b is:

(A) 24 (B) 54
(C) 72 (D) 216

23. The value of x for which $\begin{vmatrix} 3 & x \\ x & 1 \end{vmatrix} = \begin{vmatrix} 3 & 2 \\ 4 & 1 \end{vmatrix}$, is:

(A) 2 (B) $\pm 2\sqrt{2}$
(C) 4 (D) $\pm 2\sqrt{3}$

24. If $y = \left(\dfrac{1}{x}\right)^x$, then $\dfrac{d^2y}{dx^2} =$

(A) $x^{-x}(1 + \log x)^2 - x^{-(x+1)}$
(B) $x^{-x}(1 + \log x)^2 - x^{-(x-1)}$
(C) $x^{-x}(1 + \log x)^{-2} - x^{-(x+1)}$
(D) $x^{-x}(1 + \log x)^{-1} + x^{-(x-1)}$

25. If $\vec{a}$ is a unit vector and $(\vec{x} - \vec{a}).(\vec{x} + \vec{a}) = 8$ then $|\vec{x}|$ is:

(A) 2 (B) 3
(C) ±3 (D) 5

26. $\begin{vmatrix} 0 & \sin 2\alpha & -\cos^2\alpha \\ -\sin^2\alpha & 0 & \sin\alpha\sin\beta \\ -\cos\alpha\sin\beta & 2\sin^2\beta & 0 \end{vmatrix} =$

(A) 0 (B) –1
(C) Independent of α (D) Independent of β

27. $\displaystyle\int \frac{2}{x^4 - 1}\,dx =$

(A) $\log\left|\dfrac{x^2-1}{x^2+1}\right| + c$
(B) $2\tan^{-1}(x^2) + c$
(C) $\dfrac{1}{2}\log\left|\dfrac{x-1}{x+1}\right| - \tan^{-1}x + c$
(D) $\tan^{-1}x + \dfrac{1}{2}\log\left|\dfrac{x+1}{x-1}\right| + c$

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CUET (UG) - 2022

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Solution

1. **(B)**

$x = 2at$

$\frac{dx}{dt} = \frac{d}{dt}(2at)$

$= 2a\frac{d}{dt}(t) = 2a\,(1)$

$\therefore \quad \frac{dx}{dt} = 2a$

$y = at^2$

$\frac{dy}{dt} = a\frac{d}{dt}(t^2)$

$= a \times 2t$

$\therefore \quad \frac{dy}{dt} = 2at$

$\therefore \quad \frac{dy}{dx} = \frac{\frac{dy}{dt}}{\frac{dx}{dt}} = \frac{2at}{2a} = t$

$\therefore \quad \frac{dy}{dx} = t = \frac{x}{2a}$

$\therefore \quad \frac{d^2y}{dx^2} = \frac{d}{dx}\left[\frac{x}{2a}\right]$

$= \frac{1}{2a}\frac{d}{dx}(x)$

$= \frac{1}{2a}(1)$

$\therefore \quad \frac{d^2y}{dx^2} = \frac{1}{2a}$

2. **(D)**

E = {3, 6}, n(E) = 2

F = {2, 4, 6}, n(F) = 3

S = {1, 2, 3, 4, 5, 6}, n(S) = 6

$\therefore \quad P(E) = \frac{n(E)}{n(S)} = \frac{2}{6} = \frac{1}{3}$

$\therefore \quad P(F) = \frac{n(F)}{n(S)} = \frac{3}{6} = \frac{1}{2}$

Now, $E \cap F = \{6\}$

$\therefore \quad n(E \cap F) = 1$

$\therefore \quad P(E \cap F) = \frac{n(E \cap F)}{n(S)} = \frac{1}{6}$

Note that, E and F are independent events.

$\therefore$ Option (D) is incorrect.

3. **(A)**

The probability of getting a defective egg is,

$p = 10\% = \frac{1}{10}, \; q = 1 - \frac{1}{10} = \frac{9}{10}$

Here, n = 10

Probability of getting no defective eggs,

$P(X = 0) = {}^{10}C_0 \left(\frac{1}{10}\right)^0 \left(\frac{9}{10}\right)^{10}$

$P(X = 0) = \left(\frac{9}{10}\right)^{10}$

$\therefore$ Probability of getting at least one defective,

$P(X \geq 1) = 1 - P(X = 0)$

$= 1 - \left(\frac{9}{10}\right)^{10}$

$\therefore \quad P(X \geq 1) = \frac{10^{10} - 9^{10}}{10^{10}}$

4. **(B)**

$$\frac{x^3\left(\frac{d^3y}{dx^3}\right)^2 + 2x^2\left(\frac{d^2y}{dx^2}\right)^3}{(x+1)^5} = \left(3x - \frac{d^2y}{dx}\right)^4$$

$\therefore$ Here, Highest order derivative is $\left(\frac{d^3y}{dx^3}\right)^2$ with power 2.

$\therefore$ n = 3 and m = 2

$\therefore$ m + n = 3 + 2 = 5

5. **(B)**

$y = m(x - d)$

$\therefore \quad y = mx - md$

$\therefore \quad \frac{dy}{dx} = m - 0$

$\therefore \quad \frac{dy}{dx} = m$

$\therefore \quad \frac{d^2y}{dx^2} = 0$

6. **(D)**

Let $I = \int_1^2 \frac{dx}{x(x^4+1)}$

$= \int_1^2 \frac{x^3}{x^4(x^4+1)}dx$

Let $x^4 = t$

$\therefore \quad 4x^3\,dx = dt$

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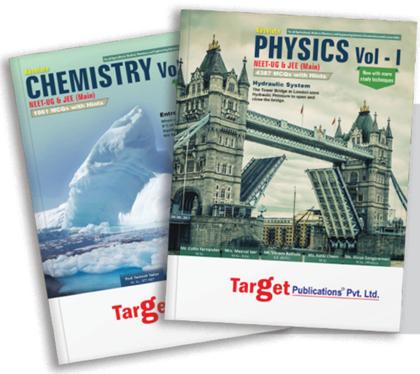

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