



B K BIRLA CENTRE FOR EDUCATION

SARALA BIRLA GROUP OF SCHOOLS
A CBSE DAY-CUM BOYS' RESIDENTIAL SCHOOL
MID APRIL TEST (2026-27)



MATHEMATICS (041)

Class : XII
Date : 13/04/26
Admission No.:

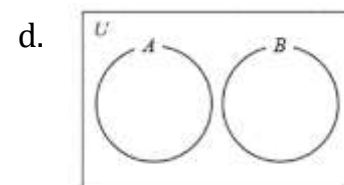
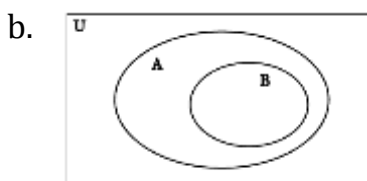
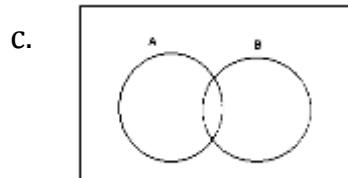
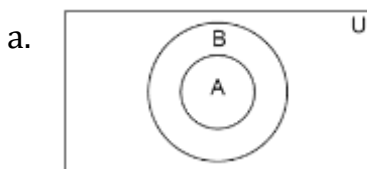
Duration : 1Hrs.
Max.Marks:25
Roll No.:

General Instructions:

- This question paper consists of 5 sections: A, B, C, D, and E.
- Section A contains 6 questions of 1 mark each. All questions are compulsory.
- Section B contains very short questions of 2 marks each.
- Section C contains short answer questions of 3 marks each.
- Section D contains long answer question of 5 marks.
- Section E contains a case-study-based question OF 4 marks
- Use of calculator is not permitted.
- Draw neat diagrams wherever required.
- Show all necessary steps for full marks.
- Read all questions carefully before attempting.

Section A

1. If $f(x) = |x| + |x - 1|$, then which of the following is correct?
 - a. $f(x)$ is both continuous and differentiable at $x = 0$ and $x = 1$.
 - b. $f(x)$ is both differentiable but not continuous at $x = 0$ and $x = 1$.
 - c. $f(x)$ is both continuous but not differentiable at $x = 0$ and $x = 1$.
 - d. $f(x)$ is neither continuous and differentiable at $x = 0$ and $x = 1$.
2. The function $f(x) = x^2 - 4x + 6$ is increasing in the interval
 - a. $(0, 2)$
 - b. $(-\infty, 2]$
 - c. $[1, 2]$
 - d. $[2, \infty)$
3. If A denotes the set of continuous functions and B denotes set of differentiable functions then which of the following depicts the correct relation between set A and set B .



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

- a. 1
b. -1
c. ± 1
d. 0

5. Let $f(x) = \max\{(1 - x), (1 + x), 2\}$ number of points where f is not differentiable

- a. 0
b. 1
c. 2
d. 3

6. **Questions number 6** are Assertion and Reason based question. Two statements are given, one labelled as Assertion (A) and the other is labelled as Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below

- a. Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).
b. Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).
c. Assertion (A) is true, but Reason (R) is false.
d. Assertion (A) is false, but Reason (R) is true.

Assertion (A): $f(x) = \begin{cases} x \sin \frac{1}{x}, & x \neq 0 \\ 0, & x = 0 \end{cases}$ is continuous at $x = 0$

Reason (R): When $x \rightarrow 0$, $\sin \frac{1}{x}$ is a finite value between -1 and 1 .

Section B

7. Differentiate $2^{\cos^2 x}$ w.r.t $\cos^2 x$

OR

If $x = e^{\frac{x}{y}}$, then prove that $\frac{dy}{dx} = \frac{x-y}{x \log x}$

8. Differentiate $y = \cos^{-1} \left(\frac{1-x^2}{1+x^2} \right)$ with respect to x where $x \in (0,1)$

Section C

9. Find k so that

$$f(x) = \begin{cases} \frac{x^2 - 2x - 3}{x + 1}, & x \neq -1 \\ k, & x = 1 \end{cases}$$

Is continuous at $x = -1$.

OR

Check the differentiability of function $f(x) = x|x|$ at $x = 0$.

10. Find the intervals in which the function $f(x) = 5x^{\frac{3}{2}} - 3x^{\frac{5}{2}}$ is

- i. Increasing
ii. Decreasing

Section D

11. $y\sqrt{(x^2 + 1)} = \log(\sqrt{(x^2 + 1)} - x)$

Then show that

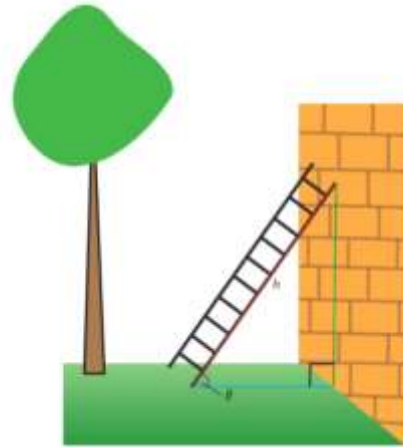
$$(x^2 + 1) \frac{dy}{dx} + xy + 1 = 0$$

OR

Find differential of $\frac{x^{(\cot x)} + (2x^2 - 3)}{2x^2 - x + 2}$ with respect to x .

Section E

12.



A ladder of fixed length ' h ' is to be placed along the wall such that it is free to move along the height of the wall.

Based upon the above information, answer the following questions :

- I. Express the distance (y) between the wall and foot of the ladder in terms of ' h ' and height (x) on the wall at a certain instant. Also, write an expression in terms of h and x for the area (A) of the right triangle, as seen from the side by an observer.
- II. Find the derivative of the area (A) with respect to the height on the wall (x), and find its critical point.