

**XII****MIND CURVE** Mid Term Maths Test Series 2025-26**Test 04**

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S no	Syllabus Covered	Chapters (In Half Yearly)	Marking Scheme
1.	Chapter 7	Integrals	17
2	Chapter 8	Application Of Integrals	09
3.	Chapter 9	Differential Equations	14

Note: Students/Teachers can refer to this Sample Paper for practice purpose. However, students may find or experience different exam pattern as syllabus or marking scheme may vary school to school.

MM:40

GENERAL INSTRUCTIONS

Time 1.5Hrs

READ CAREFULLY ALL INSTRUCTIONS

1. This Question Paper has 5 Sections A, B, C, D and E.
2. Section A has 10 MCQs carrying 1 mark each
3. Section B has 3 questions carrying 02 marks each.
4. Section C has 2 questions carrying 03 marks each.
5. Section D has 2 case based integrated units of assessment (04 marks each) with sub parts of the values of 1, 1 and 2 marks each respectively.
6. Section E has 2 questions carrying 05 marks each
7. All Questions are compulsory.
8. This paper consists of 19 questions.
 - a. Write your answers neatly and legibly.
 - b. Ensure you have not left any question unanswered

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. $\int \frac{\cos 2x - \cos 2\alpha}{\cos x - \cos \alpha} dx$ is equal to

(a) $a(\sin x + x \cos \alpha) + c$	(b) $2(\sin x + 2x \cos \alpha) + c$
(c) $2(\sin x - x \cos \alpha) + c$	(d) $2(\sin x + 2x \cos \alpha) + c$
2. $\int e^{x \log_a e} dx$ is equal to

(a) $\frac{a^x}{\log_a e} + c$	(b) $\frac{e^x}{1 + \log_a e}$	(c) $(ae)^x + c$	(d) $\frac{(ae)^x}{\log_a e} + c$
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3. Area bounded by the curve $y = \cos x$ between $x=0$ and $\frac{3\pi}{2}$ is:

(a) 1 sq.unit	(b) 2 sq.unit	(c) 3 sq.units	(d) 4 sq.units
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4. The area of the region bounded by the curve $x = 2y + 3$ and lines y and $y = -1$ is:

(a) 4 sq.units	(b) $\frac{3}{2}$ sq.units	(c) 6 sq.units	(d) 8 . sq.units
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5. If p and q are the degree and order of the differential equation $\left(\frac{d^2y}{dx^2}\right)^2 + 3\left(\frac{dy}{dx}\right) + \frac{d^3y}{dx^3} = 4$, then the value of $2p-3q$ is
 (a)3 (b)-3 (c)-7 (d)7
6. The difference of the order and the degree of the differential equation $\left(\frac{d^2y}{dx^2}\right)^2 + \left(\frac{dy}{dx}\right)^2 + x^4 = 0$
 (a)1 (b)-2 (c)2 (d)0
7. The integrating factor of the differential equation $(3x^2 + y)\frac{dy}{dx} = x$ is
 (a) $\frac{1}{x}$ (b) $\frac{1}{x^2}$ (c) $\frac{2}{x}$ (d) $-\frac{1}{x}$
8. $\int_{-1}^1 (x^3 + \sin^5 x) dx$
 (a) 0 (b)1 (c) $\frac{1}{2}$ (d)none of these

Question numbers 9 and 10 are Assertion and Reason based questions

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

9. **Assertion (A):** $\int \frac{\sin^2 x + \cos^2 x}{\sin^2 x \cos^2 x} dx = \tan x - \cot x + c$

Reason (R): $\int \sec^2 x dx = \tan x + c$ and $\int \operatorname{cosec}^2 x dx = -\cot x + c$

10. **Assertion (A):** $\int_2^8 \frac{\sqrt{10-x}}{\sqrt{x} + \sqrt{10-x}} dx = 3$

Reason (R): $\int_a^b f(x) dx = \int_a^b f(a+b-x) dx$

SECTION – B

Questions 11 to 13 carry 2 mark each.

11. (A) Area lying in first quadrant and bounded by the circle $x^2 + y^2 = 4$ and the lines $x=0$ and $x=2$

OR

- (B) Area of the region bounded by the curve $y^2 = 4x$, y-axis and the line $y=3$

12. Find the general solution of the differential equation

$$y dx - x dy + (x \log x) dx = 0$$

13. (A) Evaluate $\int_{-4}^0 |x+2| dx$

OR

(B) Evaluate $\int_0^{2\pi} |\sin x| dx$

SECTION – C

Questions 14 to 15 carry 3 mark each

14. (A) Evaluate $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{1}{1+\sqrt{\tan x}} dx$

OR

(B) Evaluate $\int_0^{\pi} \frac{x \sin x}{1+\cos^2 x} dx$

15. Evaluate the following integral: $\int (\sin^{-1} x)^2 dx$

SECTION – D

Questions 16 to 17 carry 4 mark each.

16. Let's say that we want to evaluate $\int \left[\frac{P(x)}{Q(x)} \right] dx$, where $\frac{P(x)}{Q(x)}$ is a proper rational fraction. In such cases, it is possible to write the integrand as a sum of simpler rational functions by using partial fraction decomposition. Post this, integration can be carried out easily. The following image indicates some

simple partial fractions which can be associated with various rational functions. In the table, A, B and C are real numbers to be determined suitably.

(i) Write the partial fraction decomposition of the expression $\frac{20x+35}{(x-4)^2}$

(ii) Write the partial fraction decomposition of the expression : $\frac{20x+35}{(x^2+3x+5)(x+2)}$

(iii)(A) Evaluate : $\int \frac{\tan\theta + \tan^3\theta}{1 + \tan^3\theta} dx$

OR

(B) Evaluate: $\int \frac{1}{x(x^n+1)} dx$

S. No.	Form of the rational function	Form of the partial fraction
1.	$\frac{px+q}{(x-a)(x-b)}, a \neq b$	$\frac{A}{x-a} + \frac{B}{x-b}$
2.	$\frac{px+q}{(x-a)^2}$	$\frac{A}{x-a} + \frac{B}{(x-a)^2}$
3.	$\frac{px^2+qx+r}{(x-a)(x-b)(x-c)}$	$\frac{A}{x-a} + \frac{B}{x-b} + \frac{C}{x-c}$
4.	$\frac{px^2+qx+r}{(x-a)^2(x-b)}$	$\frac{A}{x-a} + \frac{B}{(x-a)^2} + \frac{C}{x-b}$
5.	$\frac{px^2+qx+r}{(x-a)(x^2+bx+c)}$	$\frac{A}{x-a} + \frac{Bx+C}{x^2+bx+c}$
where, x^2+bx+c cannot be factorised further		

17. An equation involving derivatives of the dependent variable with respect to the independent variables is called a differential equation. A differential equation of the form $\frac{dy}{dx} = F(x, y)$ is said to be homogeneous if $F(x, y)$ is a homogeneous function of degree zero, whereas a function $F(x, y)$ is a homogenous function of f degree n if $F(\lambda x, \lambda y) = \lambda^n F(x, y)$. To solve a homogeneous differential equation of the type $\frac{dy}{dx} = g\left(\frac{y}{x}\right)$, we make the substitution $y = vx$ and then separate the variables.

(i) Show that the differential equation $(x-y)\frac{dy}{dx} = x+2y$ is a differential equation of the type

$$\frac{dy}{dx} = g\left(\frac{y}{x}\right)$$

(ii) Solve the above equation to find its general solution.

SECTION – E

Questions 18 to 19 carry 5 mark each.

18.(A) Prove that $x^2-y^2 = c(x^2+y^2)^2$ is the general solution of the differential equation $(x^3-3xy^2)dx = (y^3-3x^2y)dy$, where c is a parameter.

OR

(B) Find the particular solution of the differential equation satisfying the given conditions $x^2dy + (xy + y^2)dx = 0$; $y=1$ when $x=1$

19. Using integration, find the area of the region bounded by the curve $y = \sqrt{4-x^2}$, the lines $x = -\sqrt{2}$ and $x = \sqrt{3}$ and the x-axis

END

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