INFINITY THINK BEYOND.....

AN EDUCATIONAL INSTITUTE

XII MIND CURVE Mid Term Maths Test Series 2025-26

Test 03

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S no	Syllabus Covered	Chapters(In Half Yearly)	Marking Scheme
1.	Chapter 5	continuity and differentiability	20
2	Chapter 6	Application of Derivates	20

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	Time1.5Hrs

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. The value of λ for which f(x) = $\begin{cases} \lambda x^2 + 8x, x \leq 2 \\ 2x + 6, x > 2 \end{cases}$ is continuous at x=2 s:

(a)0 (b)2 (c)$\frac{1}{2}$ (d) $-\frac{3}{2}$

2. If y = log(cos e^x) , then $\frac{dy}{dx}$ is :

(a)$cos\ e^{x-1}$ (b) $e^{-x}\ \cos e^x$ (c) $e^x \sin e^x$ (d) $-e^x\ \tan e^x$

3. If y ($\log_x$). Then f ' (x) at x= e is :

(a) e (b) $\frac{1}{e}$ (c) –e (d) $-\frac{1}{e}$.

4. Radius of a sphere is increasing at the rate of 2cm/sec. The rate of change of its volume , when its radius is 6cm is :

(a) 288 $\pi cm^3/sec$ (b) 8 $\pi cm^3/sec$

(c) 12 $\pi cm^3/sec$ (d) None of these

5. The side of an equilateral triangle is increasing at the rate of 2 cm/s. The rate at which area increases when the side is 10 is

(a)10 cm^2/s (b) 10/ 3 cm^2/s

(c) $\sqrt{3}\ cm^2/s$ (d)$10\sqrt{3}\ cm^2/s$

6. If $y = x^3 + x^2 + x + 1$, then y
(a) has a local minimum
(b) has a local maximum
(c) neither has a local minimum nor local maximum
(d) None of the above

7. The point(s) on the curve $y = x^2$, at which y-coordinate is changing six times as fast as x coordinate is are
(a) (6, 2) (b) (2, 4) (c) (3, 9) (d) (9, 3)

8. If x sin(a+y) = sin y, then dy/dx is equal to
(a) [sin2(a+y)]/sin a
(b) sin a /[sin2(a+y)]
(c) [sin(a+y)]/sin a
(d) sin a /[sin(a+y)]

9. **Assertion (A):** f(x) : e^{-3x} always decreases
Reason (R): Any function f(x) is decreasing if $\frac{dy}{dx} < 0$
(a) Both(A) and (R) are true and (R) is the correct explanation of (A).
(b) Both(A) and (R) are true and (R) is not the correct explanation of (A)
(c) (A) is true and (R) is false
(d) (A) is false and (R) is true

10. **Assertion**$(\mathbf{A})$: The function $f(x) = (x + 2)e^{-x}$ is strictly increasing on $(-1, \infty)$.
Reasoning $(\mathbf{R})$: A function $f(x)$ is strictly increasing if $f'(x) > 0$.
(a) Both(A) and (R) are true and (R) is the correct explanation of (A)
(b) Both(A) and (R) are true and (R) is not the correct explanation of (A)
(c) (A) is true and (R) is false
(d) (A) is false and (R) is true

SECTION – B
Questions 11 to 13 carry 2 mark each.

11.(A) Find $\frac{d^2y}{dx^2}$ at $\theta = \frac{\pi}{2}$, x =a (1- cosθ) , y = a (θ + sinθ)

Or

(B) Differentiate : sin^2x w.r.t. e^{cosx}.

12.(A) Find the maximum and minimum values if any of the function given by f(x)=sin2x+5 .

Or

(B)The volume of a sphere is increasing at the rate of 8 cm^3/s. Find the rate at which its surface area is increasing when the radius of sphere is 12 cm

13. If $(cos\ x)^y = (sin\ y)^x$, find $\frac{dy}{dx}$.

SECTION – C
Questions 14 to 15 carry 3 mark each

14.(A) Find the intervals in which the function f given by f(x) = sinx + cosx, Where $0 \le x \le 2\pi$, is strictly increasing or strictly decreasing.

Or

(B) Find the intervals in which f(x) = $\sin^4 x + \cos^4 x$, $0 \le x \le \frac{\pi}{2}$ is increasing or decreasing

15. If x = acosθ+bsinθ , y = asinθ – bcosθ . Prove that $y^2y_2 - xy_1 + y = 0$

SECTION – D
Questions 16 to 17 carry 4 mark each.

16. A function f(x) is said to be continuous in an open interval (a,b), if the continuous at every point in this interval . A function f(x) is said to be continuous in the closed interval [a ,b] , if f(x) is continuous in (a ,b) and $\lim_{h\to 0} f(a+h)$= f(a) and $\lim_{h\to 0} f(b-h)$= f(b).

If function f(x) = $\begin{cases} \frac{\sin(a+1)x+\sin x}{x} & , x<0 \\ c & , x=0 \\ \frac{\sqrt{x+bx^2}-\sqrt{x}}{bx^{3/2}} & , x>0 \end{cases}$ is continuous at x=0.

Based on the above information, give the answer of the following questions:

(a) Find the value of b.

(b) Find the value of (a + c)

17. In an elliptical sport field the authority wants to design a rectangular soccer field with the maximum possible area . The sport field is given by the graph of $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$

(i) If the length and the breadth of the rectangular field be 2x and 2y respectively , then find the area function in term of x.

(ii) Find the critical point of the function

(iii)(a) Use first derivates Test to find the length 2x and width 2y of the soccer field (in terms of a & b) that maximize its area .

Or

(b)Use second derivates Test to find the length 2x and width 2y of the soccer field (in terms of a & b) that maximize its area **.**

SECTION – E
Questions 18 to 19 carry 5 mark each.

18 If $(x-a)^2+(y-b)^2=(c)^2$ for some c>0,prove that

$\frac{\left[1+\left(\frac{dy}{dx}\right)^2\right]^{\frac{3}{2}}}{\frac{d^2x}{dx^2}}$ is a constant independent of a and b.

19. If length of three sides of a trapezium other than base are equal to 10cm, then find the area of the trapezium when it is maximum.

OR

Of all the closed cylindrical cans (right circular), of a given volume of 100 cubic centimeters, find the dimensions of the can which has the minimum surface area?

END