

BOARD OF INTERMEDIATE EDUCATION (TS)

JUNIOR INTER MATHEMATICS – IB

MODEL PAPER

Time: 3 hours

Max. Marks: 75

SECTION – A

I. i) Very short answer type questions.

ii) Answer ALL questions.

iii) Each question carries TWO marks.

10 × 2 = 20

1. Find the equation of the line perpendicular to $5x - 3y + 1 = 0$ and passing through the point $(4, -3)$.
2. Transform the equation $x + y + 1 = 0$ into normal form.
3. If $(3, 2, -1)$, $(4, 1, 1)$, $(6, 2, 5)$ are three vertices and $(4, 2, 2)$ is the centroid of a tetrahedron, find the fourth vertex.
4. Find the angle between the planes $2x - y + z = 6$ and $x + y + 2z = 7$.
5. Compute $\lim_{x \rightarrow 0} \frac{e^{7x} - 1}{x}$.
6. Compute $\lim_{x \rightarrow \infty} \frac{x^2 + 5x + 2}{2x^2 - 5x + 1}$.
7. Find the derivative of $(5 \sin x + e^x \log x)$.
8. If $y = ax^{n+1} + bx^{-n}$ then prove that $x^2 y^{11} = n(n+1)y$.
9. If $y = f(x) = x^2 + x$ then find dy , δy when $x = 10$, $\delta x = 0.1$.
10. Verify Rolle's theorem for the function $f(x) = x^2 - 1$ on $[-1, 1]$.

SECTION – B

II. i) Short answer type questions.

ii) Answer any FIVE questions.

iii) Each question carries FOUR marks.

5 × 4 = 20

11. The distance from P to the point A(5, -4), B(7, 6) are in the ratio 2 : 3 then find the locus of P.
12. When the origin is shifted to the point (2, 3), the transformed equation of a curve is $x^2 + 3xy - 2y^2 + 17x - 7y - 11 = 0$. Then find the original equation of the curve.
13. If the line joining points $(3, y)$, $(2, 7)$ is parallel to the line joining points $(-1, 4)$, $(0, 6)$ then find the value of y.
14. Verify the continuity of the function $f(x) = \begin{cases} \frac{x^2 - 9}{x^2 - 2x - 3} & \text{if } 0 < x < 5 \\ \frac{3}{2} & \text{if } x = 3 \end{cases}$ at the point $x = 3$.

15. Using first principle find the derivative of $\tan 2x$.
16. The volume of a cube increasing at the rate of $8 \text{ cm}^3/\text{sec}$. How fast is the surface area increasing, when the length of an edge is 12 cm .
17. Find the lengths of subtangent, subnormal at a point 't' on the curve $x = a(\cos t + t \sin t)$, $y = a(\sin t - t \cos t)$.

SECTION - C

III. i) Long answer type questions.

ii) Answer any FIVE questions.

iii) Each question carries SEVEN marks.

$5 \times 7 = 35$

18. Find the equation of the lines passing through $(1, 2)$ and making an angle 60° with $\sqrt{3}x + y + 2 = 0$.
19. Show that the area of the triangle formed by the lines $ax^2 + 2hxy + by^2 = 0$ and $lx + my + n = 0$ is $\left| \frac{n^2 \sqrt{h^2 - ab}}{am^2 - 2h/m + bl^2} \right|$.
20. $lx + my = 1$ is a chord of the circle $x^2 + y^2 = a^2$ with centre $(0, 0)$. Find the condition that the chord subtends right angle of the centre of the circle.
21. The vertices of a triangle ABC are $A(1, 4, 2)$, $B(-2, 1, 2)$, $C(2, 3, -4)$ then find $\angle A$, $\angle B$, $\angle C$.
22. If $\sqrt{1 - x^2} + \sqrt{1 - y^2} = a(x - y)$ then prove that $\frac{dy}{dx} = \sqrt{\frac{1 - y^2}{1 - x^2}}$.
23. If the tangent at any point on the curve $x^{2/3} + y^{2/3} = a^{2/3}$ intersects the co-ordinate axes at A, B. Then show that the length AB is a constant.
24. From a rectangular sheet of dimensions $30 \text{ cm} \times 80 \text{ cm}$ four equal squares of side $x^{-1} \text{ cm}$ are removed at the corners and the sides are then turned up so as to form an open rectangular box. Find the value of 'x' so that the volume of the box is maximum.

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