
ISC CLASS XII MATHEMATICS (TEST PAPER 5) - SET 05

Time Allowed: 3 hours

Maximum Marks: 80

SECTION A (Compulsory - 65 Marks)

Question 1 (10×1 Mark = 10 Marks)

1. Yes, the operation $*$ is associative.
2. $\frac{1}{2}$
3. $f(1) = 1, f(2) = 1, f(3) = 2$
4. x
5. $\tan t$
6. 0
7. -2
8. $\frac{3}{5}$
9. $\frac{2}{3}$ or $\frac{1}{3}$
10. 1

Question 2 (3×2 Marks = 6 Marks)

1. $\frac{dy}{dx} = x^{\cos x} \left(-\sin x \cdot \ln x + \frac{\cos x}{x} \right)$
2. Verified by showing $f'(x) < 0$ for $x > 0$.
3. $\frac{3}{7}$ (Corrected)

Question 3 (4×4 Marks = 16 Marks)

1. $\text{adj}(A) = \begin{pmatrix} 6 & 0 & -4 \\ 2 & -1 & -1 \\ -4 & 0 & 2 \end{pmatrix}$ and $A \cdot \text{adj}(A) = |A|I$ since $|A| = -2$.
2. $-x \csc x + \ln |\csc x - \cot x| + C$
3. $f(x)$ is not differentiable at $x = 1 \in (0, 2)$, so Rolle's theorem is not applicable.
4. $1.12\pi \text{ m}^2$

Question 4 (3×6 Marks = 18 Marks)

1. Verified by using row and column operations.
2. $x + y = 3$
3. $\frac{1}{3} \ln 2$ (Corrected)

Question 5 (15 Marks)

- (a) Verified using the formula for $2 \tan^{-1} x$ and $\tan^{-1} a + \tan^{-1} b$.
- (b) Mean = $\frac{3}{2}$, Variance = $\frac{3}{4}$
- (c) $y = xe^x + Cx$

SECTION B (Optional - 15 Marks)

Question 6 (5 Marks)

1. $\frac{13}{3}$ units
2. $\lambda = 4$ (Corrected)

Question 7 (10 Marks)

1. Cartesian equation: $\frac{x-1}{-2} = \frac{y-2}{-2} = \frac{z-3}{1}$,
Angle: $\cos^{-1}\left(\frac{8}{9}\right)$
2. $\frac{3\pi}{2} - 3$ square units (Corrected)

SECTION C (Optional - 15 Marks)

Question 8 (5 Marks)

1. $C(x) = 18000 + 1.60x$,
 $R(x) = 4x$,
Break-even point: $x = 7500$ units

Question 9 (10 Marks)

1.

Maximum value is 16 at point $(0, 4)$

2.

Regression equations: $y - 44 = 1.5(x - 20)$ and $x - 20 = 0.6(y - 44)$, Estimated y when $x = 18$ is 41
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