

Sample Paper-04 (unsolved)
Mathematics
Class – XI

Time allowed: 3 hours

Maximum Marks: 100

General Instructions:

- a) All questions are compulsory.
- b) The question paper consists of 26 questions divided into three sections A, B and C. Section A comprises of 6 questions of one mark each, Section B comprises of 13 questions of four marks each and Section C comprises of 7 questions of six marks each.
- c) All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.
- d) Use of calculators is not permitted.

Section A

1. Find the following (a) $A \cap B$ (b) $A \cup B$, (c) $B \cap (A \cup C)$ if $A = \{1, 3, 5, 8\}$; $B = \{3, 5, 7\}$ $C = \{2, 4, 6, 8\}$
2. State whether the equation $x^2 + y^2 = 1$ defines y as a function of x
3. Find the Domain and Range of the following functions. (a) $\sin^{-1} x$, (b) $\cos^{-1} x$, (c) $\tan^{-1} x$
4. Solve for x and y if $(1 + 2i)x + (3 - 5i)y = 1 - 3i$
5. Which of the following is a function from $\{1, 2, 3, 4, 5\}$ to $\{1, 2, 3, 4, 5\}$ that is one-to-one and on to
(1) $\{(1, 2), (2, 3), (3, 4), (4, 5), (5, 5)\}$
(2) $\{(1, 5), (2, 4), (3, 3), (4, 2), (5, 1)\}$
(3) $\{(1, 3), (2, 3), (3, 3), (4, 3), (5, 3)\}$
(4) $\{(1, 1), (2, 4), (3, 1), (4, 2), (5, 1)\}$
6. Write an identity function

Section B

7. If α, β are the roots of the equation $ax^2 + bx + c = 0$ find the equation whose roots are $\frac{\alpha}{\beta}, \frac{\beta}{\alpha}$
8. Find the r^{th} term from the end of $(x + a)^n$.
9. Solve the inequality $-5 < 3x - 2 < 1$
10. Determine whether the graph of the equation $y = \frac{10x^2}{1 + x^2}$ is symmetric about x-axis, y-axis, or about the origin
11. Find $(f \circ f)(2)$ if $f : R \rightarrow R$ defined by $f(x) = x^2 + 2x$
12. Evaluate $\cos 36^\circ - \cos 72^\circ$

13. Find the limit $\lim_{x \rightarrow a^2} \frac{a^2 - x}{a - \sqrt{x}}$
14. Prove that if $f : A \rightarrow B$ and $\phi : B \rightarrow C$ are one-to-one functions, show that then $\phi \circ f$ is one-to-one
15. Find a polynomial of degree 3 with real coefficients whose roots are 2, $(1-i)$ and $f(1) = 3$
16. Find the equations to the bisectors of the angle formed by the intersection of lines $12x + 5y + -4 = 0$ and $3x + 4y + 7 = 0$
17. Prove that $\sqrt{\sin^4 \theta + 4 \cos^2 \theta} - \sqrt{\cos^4 \theta + 4 \sin^2 \theta} = \cos 2\theta$
18. Prove by mathematical induction that $1 + a + a^2 + a^3 + \dots + a^n = \frac{a^{n+1} - 1}{a - 1}$
19. Prove that if $x \in (A \cap B)'$ then $x \in A' \cup B'$

Section C

20. Prove that $2^a, 2^b, 2^c$ are in GP if a, b, c are in AP
21. The letters of the word FIERY are rearranged at random. What is the probability that one arrangement chosen at random will begin and end with a vowel
22. Find the number of terms in the expansion $(a + b + c)^{10}$
23. Differentiate $a(b^{\log_b x})$ with respect to x
24. There are 4 ten rupee notes and 3 two rupee notes placed at random in a line. Find the probability that the both extreme notes are two rupee notes.
25. Find the equation of hyperbola whose foci are at $(10, 2), (0, 2)$ and whose eccentricity is $\frac{10}{3}$
26. The variance of 7 observations is 16. If each observation is multiplied by 2, find the variance of the resulting observation