COMMON FIRST REVISION TEST – 2023

Standard XI Reg.No. : | | | | | | |

MATHEMATICS

Time: 3.00 hrs. **Part - I** **Marks: 90**

I. Choose the correct answer: **20 x 1 = 20**

1. The range of the function $\frac{1}{1-2\sin x}$ is

   a) $(-\infty, -1) \cup (\frac{1}{3}, \infty)$ b) $(-1, \frac{1}{3})$

   c) $[-1, \frac{1}{3}]$ d) $(-\infty, -1) \cup [\frac{1}{3}, \infty)$

2. The solution set of the following inequality $|x - 1] \geq |x - 3]$ is

   a) [0, 2] b) [2, ∞) c) (0, 2) d) (−∞, 2)

3. The value of $\log_3 11 \log_{11} 13 \log_{13} 15 \log_{15} 27 \log_{27} 81$ is

   a) 1 b) 2 c) 3 d) 4

4. In a triangle ABC, $\sin^2 A + \sin^2 B + \sin^2 C = 2$, then the triangle is

   a) equilateral triangle b) isosceles triangle

   c) right angle triangle d) scalene triangle

5. The triangle of maximum area with constant perimeter 12m

   a) is an equilateral triangle with side 4m

   b) is an isosceles triangle with sides 2m, 5m, 5m

   c) is a triangle with sides 3m, 4m,5m d) Does not exist.

6. The number of 5 digit numbers all digits of which are odd is

   a) 25 b) 5^5 c) 5^6 d) 625

7. 1 + 3 + 5 + 7 + ... + 17 =

   a) 101 b) 81 c) 71 d) 61

8. The coefficient of x^6 in $(2 + 2x)^{10}$ is

   a) $10C_6$ b) 2^6 c) $10C_6\, 2^6$ d) $10C_6\, 2^{10}$

9. Which of the following equation is the locus of $(at^2, 2at)$

   a) $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ b) $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ c) $x^2 + y^2 = a^2$ d) $y^2 = 4ax$

10. Straight line joining the points (2,3) and (–1, 4) passes through the point (α, β) if

    a) $\alpha + 2\beta = 7$ b) $3\alpha + \beta = 9$ c) $\alpha + 3\beta = 11$ d) $3\alpha + \beta = 11$

11. If $A = \begin{bmatrix} \lambda & 1 \\ -1 & -\lambda \end{bmatrix}$, then for what value of λ, $A^2 = 0$?

    a) 0 b) ±1 c) –1 d) 1

12. If A is a square matrix, then which of the following is not symmetric?

    a) $A + A^T$ b) AA^T c) A^TA d) $A - A^T$

13. The value of $\overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{DA} + \overrightarrow{CD}$ is

    a) $\overrightarrow{AD}$ b) $\overrightarrow{CA}$ c) $\vec{0}$ d) $-\overrightarrow{AD}$

14. If $|\vec{a}| = 13$, $|\vec{b}| = 5$ and $\vec{a}.\vec{b} = 60^\circ$ then $|\vec{a} \times \vec{b}|$ is

a) 15 b) 35 c) 45 d) 25

15. $\lim_{x \to \infty} \frac{\sin x}{x} =$

a) 1 b) 0 c) ∞ d) $-\infty$

16. At $x = \frac{3}{2}$ the function $f(x) = \frac{|2x-3|}{2x-3}$ is

a) continuous c) discontinuous c) differentiable d) non-zero

17. If $y = mx + c$ and $f(0) = f'(0) = 1$, then $f(2)$ is

a) 1 b) 2 c) 3 d) –3

18. The derivative of $f(x) = x|x|$ at $x = -3$ is

a) 6 b) –6 c) does not exist d) 0

19. $\int \sin^3 x \, dx$ is

a) $\frac{-3}{4}\cos x - \frac{\cos 3x}{12} + c$ b) $\frac{3}{4}\cos x + \frac{\cos 3x}{12} + c$

c) $\frac{-3}{4}\cos x + \frac{\cos 3x}{12} + c$ d) $\frac{-3}{4}\sin x - \frac{\sin 3x}{12} + c$

20. If X and Y be two events such that $P(X/Y) = \frac{1}{2}$, $P(Y/X) = \frac{1}{3}$ and $P(X \cap Y) = \frac{1}{6}$, then $P(X \cup Y)$ is

a) $\frac{1}{3}$ b) $\frac{2}{5}$ c) $\frac{1}{6}$ d) $\frac{2}{3}$

Part - II

II. Answer any 7 questions. (Q.No.30 is compulsory) **7 x 2 = 14**

21. Write the set {–1, 1} in set builder form.
22. Solve $|2x - 17| = 3$ for x.
23. Convert 18° to radians.
24. Find the equation of the locus of the point P such that the line segment AB, joining the points A(1,–6) and B(4,–2), subtends a right angle at P.
25. Compute |A| using Sarrus rule if $A = \begin{bmatrix} 3 & 4 & 1 \\ 0 & -1 & 2 \\ 5 & -2 & 6 \end{bmatrix}$
26. Calculate $\lim_{x \to 0} \frac{1}{x^2 + x^3}$
27. Differentiate: $y = x^3 + 5x^2 + 3x + 7$
28. Integrate with respect to x : e^{3x}
29. Suppose a fair die is rolled. Find the probability of getting (i) an even number (ii) multiple of three

30. A mobile phone has a passcode of 6 distinct digits. What is the maximum number of attempts one makes to retrieve the passcode?

Part - III

III. Answer any 7 questions. (Q.No.40 is compulsory) **7 x 3 = 21**

31. Prove that the relation "friendship" is not an equivalence relation on the set of all people in Chennai.

32. Prove that $\cos A \cos 2A \cos 2^2A \cos 2^3A \ldots\ldots\ldots \cos 2^{n-1}A = \frac{\sin 2^n A}{2^n \sin A}$

33. If $nC_{12} = nC_9$, find $21C_n$.

34. Find $\sqrt[3]{65}$

35. Determine 3B + 4C – D if B,C, D are given by $B = \begin{bmatrix} 2 & 3 & 0 \\ 1 & -1 & 5 \end{bmatrix}$, $C = \begin{bmatrix} -1 & -2 & 3 \\ -1 & 0 & 2 \end{bmatrix}$, $D = \begin{bmatrix} 0 & 4 & -1 \\ 5 & 6 & -5 \end{bmatrix}$

36. Find the angle between the vectors $5\hat{i} + 3\hat{j} + 4\hat{k}$ and $6\hat{i} - 8\hat{j} - \hat{k}$.

37. Find $\frac{dy}{dx}$ if $x = at^2$, $y = 2at$, $t \neq 0$

38. If $f'(x) = 3x^2 - 4x + 5$ and $f(1) = 3$, then find $f(x)$

39. Five mangoes and 4 apples are in a box. If two fruits are chosen at random, find the probability that (i) one is a mango and the other is an apple (ii) both are of the same variety.

40. Prove that $\log_{a^2} a \log_{b^2} b \log_{c^2} c = \frac{1}{8}$

Part - IV

IV. Answer all the questions. **7 x 5 = 35**

41. a) Write the values of f at –3,5,2,–1, 0 if $f(x) = \begin{cases} x^2 + x - 5 & \text{if } x \in (-\infty, 0) \\ x^2 + 3x - 2 & \text{if } x \in (3, \infty) \\ x^2 & \text{if } x \in (0,2) \\ x^2 - 3 & \text{otherwise} \end{cases}$

(OR)

b) Prove that $\sqrt[3]{x^3 + 6} - \sqrt[3]{x^3 + 3}$ is approximately equal to $\frac{1}{x^2}$ when x is sufficiently large.

42. a) Resolve into partial fractions: $\frac{2x}{(x^2 + 1)(x - 1)}$

(OR)

b) If $A + B + C = \pi$, prove that $\cos^2 A + \cos^2 B + \cos^2 C = 1 - 2\cos A \cos B \cos C$.

43. a) Prove that $3^{2n+2} - 8n - 9$ is divisible by 8 for all $n \geq 1$.

(OR)

b) The slope of one straight lines $ax^2 + 2hxy + by^2 = 0$ is thrice times the other, show that $3h^2 = 4ab$

44. a) The Pamban Sea Bridge is a railway bridge of length about 2065 m constructed on the Palk Strait, which connects the Island town of Rameswaram to Mandapam, the main land of India. The Bridge is restricted to a uniform speed of only 12.5 m/s. If a train of length 560 m starts at the entry point of the bridge from Mandapam, then (i) find an equation of the motion of the train. (ii) when does the engine touch island (iii) when does the last coach cross the entry point of the bridge (iv) what is the time taken by a train to cross the bridge.

(OR)

b) Prove that $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = abc\left(1 + \frac{1}{a} + \frac{1}{b} + \frac{1}{c}\right)$

45. a) Show that $\begin{vmatrix} x & a & a \\ a & x & a \\ a & a & x \end{vmatrix} = (x-a)^2 (x+2a)$

(OR)

b) If g and f are continuous functions with $f(3) = 5$ and $\lim_{x \to 3}[2f(x) - g(x)] = 4$, find $g(3)$

46. a) If ABCD is a quadrilateral and E and F are the midpoints of AC and BD respectively, then prove $\overrightarrow{AB} + \overrightarrow{AD} + \overrightarrow{CB} + \overrightarrow{CD} = 4\overrightarrow{EF}$

(OR)

b) If $y = e^{\tan^{-1} x}$, show that $(1 + x^2)y'' + (2x - 1)y' = 0$

47. a) Evaluate: $\int \frac{1}{(x-2)^2 + 1} dx$

(OR)

b) A factor has two machines I and II. Machine I produces 40% of items of the output and Machine II produces 60% of the items. Further 4% of items produced by Machine I are defective and 5% produced by Machine II are defective. An item is drawn at random. If the drawn item is defective, find the probability that it was produced by Machine II.

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