JEE MAIN 27 JANUARY 2024 SHIFT 2 QUESTION PAPER

MATHEMATICS

1. If $2\tan^2\theta - 5\sec\theta = 1$ has exactly 7 solutions in $[\theta, n\pi/2]$ for the least value of $n \in N$, then $\Sigma^{n}_{k=1} (k/2^n)$ is equal to?

2. If $dy/dx = (x + y - 2) / (x - y)$, and $y(0) = 2$, then find $y(2)$.

3. Find the 20th term from the end of the progression:
   20, 19(1/4), 18(1/2), 17(3/4), ..., -129(1/4)

4. $\int_0^{\pi} dx / (1 - 2a \cos x + a^2) = ?$

5. An urn contains 6 white and 9 black balls. Two successive draws of 4 balls are made without replacement. The probability that the first draw gives all white balls and the second draw gives all black balls is:

6. Considering the principal values of inverse trigonometric functions, find the positive real values of x satisfying $\tan^{-1}(x) + \tan^{-1}(2x) = \pi/4$.

7. Let R be the interior region between the lines $3x - y + 1 = 0$ and $x + 2y - 5 = 0$ containing the origin. The set of all values of a for which points $(a^2\ a + 1)$ lie is?

8. The position vectors of vertices A, B, C of a triangle are $i + 2j + 3k$, $i + j + 3k$,$2i + j + 3k$ respectively. Let x is the length of the angle bisector of angle BAC, then the value of x^2 is?

9. If A is a 2 x 2 matrix and I is an Identity matrix of order 2 & $| A - \lambda * I | = 0$ gives values of λ as -1 & 3. Then, the trace of A^2 is equal to?

10. The area bounded by $0 \le y \le \min\{2x, 6x - x^2\}$ and x-axis is A. then 12A is:

11. If the line $x + y = 0$ is tangent to the circle $(x - \lambda)^2 + (y - \beta)^2 = 50$, then $(\lambda + \beta)^2 = ?$

12. If the mean of 15 observations is 12 and the standard deviation is 3. If 12 is replaced by 10 in data, then the new mean is μ and variance is σ^2 then what is the value of $15(\mu + \mu^2 + \sigma^2) = ?$