JEE Main Shift 2 Analysis 27 JANUARY 2024

## 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 $\Sigma^{n}{ }_{k=1}\left(k / 2^{n}\right)$ is equal to?

Answer. 91/2^13
2. If $d y / d x=(x+y-2) /(x-y)$, and $y(0)=2$, then find $y(2)$.

Answer. 0
3. Find the 20th term from the end of the progression:

20, 19(1/4), 18(1/2), 17(3/4), ..., -129(1/4)
Answer. -115
4. $\int_{0} 0^{\pi} d x /\left(1-2 a \cos x+a^{2}\right)=$ ?

Answer. $I=\pi /\left(1-\mathrm{a}^{2}\right)$
5. $\int \frac{\left(x^{8}-x^{2}\right)}{\left(x^{12}+3 x^{6}+1\right) \tan ^{-1}\left(x^{3}+\frac{1}{x^{3}}\right)} d x=$ ?

Answer. $\frac{1}{3} \ln \left|\left(\tan ^{-1}\left(x^{3}+\frac{1}{x^{3}}\right)\right)\right|+C$
6. 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:

Answer. 3/715
7. Let $f: R-\left\{-\frac{1}{2}\right\} \rightarrow R$ and $g: R-\left\{-\frac{5}{2}\right\} \rightarrow R$ be defined as $f(x)=\frac{2 x+3}{2 x+1}$ and $g(x)=\frac{|x|+1}{2 x+5}$ then the domain of the function of $f(g(x))$ is ?
Answer. $R-\left\{-\frac{5}{2}\right\} \rightarrow R$
8. Considering the principal values of inverse trigonometric functions, find the positive real values of $x$ satisfying $\tan ^{-1}(x)+\tan ^{-1}(2 x)=\pi / 4$.

Answer. $\frac{\sqrt{17}-3}{4}$
9. Let $R$ be the interior region between the lines $3 x-y+1=0$ and $x+2 y-5=0$ containing the origin. The set of all values of $a$ for which points ( $a^{2} a+1$ ) lies lie is?

Answer. $(-3,0) \cup\left(\frac{1}{3}, 1\right)$
10. The position vectors of vertices $A, B, C$ of a triangle are $i+2 j+3 k, i+j+3 k, 2 i+j+3 k$ respectively. Let $x$ is the length of the angle bisector of angle $B A C$, then the value of $x^{2}$ is?

Answer. $4-2 \sqrt{2}$
11. If $A$ is a $2 \times 2$ matrix and $I$ is an Identity matrix of order $2 \&\left|A-\lambda^{*}\right| \mid=0$ gives values of $\lambda$ as -1 \& 3. Then, the trace of $A^{2}$ is equal to?

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

Answer. 304 sq.units.
13. If the line $x+y=0$ is tangent to the circle $(x-\lambda)^{2}+(y-\beta)^{2}=50$, then $(\lambda+\beta)^{2}=$ ?

Answer. 100
14. 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 $\mu$ and variance is $\sigma^{2}$ then what is the value of $15\left(\mu+\mu^{2}+\sigma^{2}\right)=$ ?

Answer. 2429


