MATHS

BOOKS - NTA MOCK TESTS

NTA TPC JEE MAIN TEST 104

Mathematics Single Choice

1. Find the sum of the series

$$\frac{2\left(\frac{n}{2}\right)!\left(\frac{n}{2}\right)!}{n!}\left[C_0^2 - 2C_1^2 + 3C_2^2 - \dots + (-1)^n(n+1)C_n^2\right]$$

where C_r stands for ${}^nC_r$ and n is an even positive integer.

A. 0

B. $(-1)^{\frac{\pi}{2}}(n+1)$

C. $(-1)^{\frac{\pi}{2}}(n+2)$

D. $(-1)^n n$

Answer: C

View Text Solution

2. The number of real tangents that can be drawn to the ellipse $3x^2 + 5y^2 = 32$ and $25x^2 + 9y^2 = 450$ passing through (3,5) is

A. 4

B. 1

C. 0

D. 3

Answer: D

View Text Solution

3. Consider the following three propositions:

P:7 is a prime number

Q : 7 is a factor of 192

R:L.C.M of 7 and 5 is 35

Then the truth value of which one of the following statements is true?

A. $P \vee (\sim Q \wedge R)$

B. $(P \wedge Q) \vee (\sim R)$

C. $(\sim P) \vee (Q \wedge R)$

D. $(\sim P) \wedge (\sim Q \wedge R)$

Answer: A

View Text Solution

4. Consider the following statements :

1. The determinants $\begin{vmatrix} 1 & a & bc \\ 1 & b & ca \\ 1 & c & ab \end{vmatrix}$ and $\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix}$ are not identically equal.

2. For $a > 0, b > 0, c > 0$ the value of the determinant $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$ is

always positive.

3. If $\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} = \begin{vmatrix} a_1 & b_1 & 1 \\ a_2 & b_2 & 1 \\ a_3 & b_3 & 1 \end{vmatrix}$, then the two triangles with vertices $(x_1, y_1), (x_2, y_2), (x_3, y_3)$ and $(a_1, b_1), (a_2, b_2), (a_3, b_3)$ must be congruent. Which of the statement given above is/are correct?

A. Only (1)

B. Only (2)

C. Only (3)

D. None of these

Answer: D

View Text Solution

5. If A, B and C are any three sets, then $A - (B \cup C)$ is equal to

A. $(A - B) \cup (A - C)$

B. $(A - B) \cap (A - C)$

C. $(A - B) \cup C$

D. $(A - B) \cap C$

Answer: B

View Text Solution

6. Tangents are drawn from any point on the hyperbola $\frac{x^2}{9} - \frac{y^2}{4} = 1$ to the circle $x^2 + y^2 = 9$. Find the locus of mid point of the chord of contact.

A. $\frac{x^2}{9} - \frac{y^2}{4} = \frac{(x^2 + y^2)^2}{81}$

B. $\frac{x^2}{9} - \frac{y^2}{16} = \frac{(x^2 + y^2)^2}{81}$

C. $\frac{x^2}{9} + \frac{y^2}{4} = \frac{(x^2 + y^2)^2}{81}$

D. None of these

Answer: A

View Text Solution

7. The minimum value of sum of real numbers $a^{-6}, 2a^{-4}, 2a^{-3}, 13$ and $2a^{10}$ with $a > 0$ is equal to

A. 1

B. 2

C. 4

D. 8

Answer: D

View Text Solution

8. A fair die is rolled. The probability that the first time 1 occurs at the even throw is

A. $\frac{1}{6}$

B. $\frac{5}{11}$

C. $\frac{6}{11}$

D. $\frac{5}{36}$

Answer: B

View Text Solution

9. The shortest distance between the y- axis and the line $2x + 3y + 5z + 1 = 0 = 3x + 4y + 6z + 2$ is

A. $\frac{2}{\sqrt{5}}$

B. 0

C. $\frac{\sqrt{5}}{2}$

D. $\frac{2}{5}$

Answer: A

View Text Solution

10. The function $f(x) = \tan^{-1}(\sin x + \cos x)$ is an increasing function in

A. $\left(0, \frac{\pi}{2}\right)$

B. $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

C. $\left(\frac{\pi}{4}, \frac{\pi}{2}\right)$

D. $\left(-\frac{\pi}{2}, \frac{\pi}{4}\right)$

Answer: D

View Text Solution

11. If α, β, γ and a, b, c are complex variables such that $\frac{\alpha}{a} + \frac{\beta}{b} + \frac{\gamma}{c} = 1 + i$ and $\frac{a}{\alpha} + \frac{b}{\beta} + \frac{c}{\gamma} = 0$, then $\frac{\alpha^2}{a^2} + \frac{\beta^2}{b^2} + \frac{\gamma^2}{c^2} =$?

A. 0

B. -1

C. $2i$

D. $-2i$

Answer: C

View Text Solution

12. $\lim_{n \to \infty} \left(\frac{2n^2 - 3}{2n^2 - n + 1} \right)^{\frac{n^2 - 1}{n}}$ is equal to

A. $\frac{1}{\sqrt{e}}$

B. $\sqrt{e}$

C. e

D. $\frac{1}{e}$

Answer: B

View Text Solution

13. The value of cin Rolle's theorem for the function

$f(x)=\begin{cases} x^2\cos(1/x), & x\neq 0\\ 0, & x=0\end{cases}$ in the interval [-1,1] is

A. $-1/2$

B. $1/4$

C. 0

D. non-existence in the interval

Answer: C

View Text Solution

14. let $f(x)=\dfrac{x}{(a+x^n)^{\frac{1}{n}}}$ for $n>2$ and g(x) = fofof........of(x) (n times). Then $\int x^{n-2}g(x)dx$ equals

A. $\dfrac{1}{n(n-1)}(1+nx^n)^{1-\frac{1}{n}}+K$

B. $\dfrac{1}{n-1}(1+nx^n)^{1-\frac{1}{n}}+K$

C. $\dfrac{1}{n(n-1)}(1+nx^n)^{1+\frac{1}{n}}+K$

D. $\dfrac{1}{n-1}(1+nx^n)^{1+\frac{1}{n}}+K$

Answer: A

View Text Solution

15. If (p, q) represents the point through which the chord of contact of pair of tangent for the circle $x^2+y^2=1$ always passes, when it is given that the pair of tangent is drawn from any point on the line $y=4-2x$, then the value of $2p+4q$ is

A. 1

B. 2

C. 3

D. 4

Answer: B

View Text Solution

View Text Solution

16. The area included between the parabola $y=\frac{x^2}{4a}$ and the curve $y=\frac{8a^3}{(x^2+4a^2)}$ is $\{a>0\}$ (in sq. units)

A. $a^2\left(2\pi+\frac{2}{3}\right)$

B. $a^2\left(2\pi-\frac{8}{3}\right)$

C. $a^2\left(\pi+\frac{4}{3}\right)$

D. $a^2\left(2\pi-\frac{4}{3}\right)$

Answer: D

View Text Solution

17. $\tan^{-1}\frac{x-1}{x-2}+\tan^{-1}\frac{x+1}{x+2}=\frac{\pi}{4}$, then the value of x could be

A. $\pm\frac{1}{\sqrt{5}}$

B. $\pm\frac{1}{\sqrt{3}}$

C. $\pm\frac{1}{\sqrt{9}}$

D. $\pm\frac{1}{\sqrt{2}}$

Answer: D

View Text Solution

18. If $ax^2+2hxy-ay^2=0, a>0$ represents a pair of straight lines forming with $2x+3y=-8$ an isosceles triangle which is right angled at origin, then (a + h) is

A. 7

B. 17

C. -7

D. -17

Answer: C

View Text Solution

19. Find solution of the differential equation

$$\frac{xdy}{ydx} + \frac{\sin(y) + \cos(x)\ \ \ln\ \ y^x}{\sin(x) + \cos(y)\ \ \ln\ \ x^y} = 0.$$

A. $(\sin y)^z + (\sin x)^y = C$

B. $y^{\sin x} + x^{\sin y} = C$

C. $(\sin y)^x \cdot (\sin x)^y = C$

D. $y^{\sin x} \cdot x^{\sin y} = C$

Answer: D

View Text Solution

20. For every positive integer n, $2^n < n!$ when

A. $n < 4$

B. $n \geq 4$

C. $n < 3$

D. None of these

Answer: B

View Text Solution

Mathematics Subjective Numerical

1. If $x^3 + y^3 = t + \frac{4}{t}$ and $x^6 + y^6 = t^2 + \frac{16}{t^2}$ then find $x^4 y^2 \frac{dy}{dx}$.

View Text Solution

2. 3 prizes are to be given to 4 students. Find the number of ways of distributing these prizes so that no student gets all the prizes.

View Text Solution

3. If the system of equations $x + \lambda y - z = 0.2x - y + \lambda z = 0$ and $\lambda x + y + 2z = 0$ has a non-trivial solution, then find how many real values of λ exists.

View Text Solution

4. [x] and {x} represent the greatest integer function and fractional part function respectively. Let $f(x) = [x] + \sum_{i=1}^{2020} \frac{\{x+r\}}{2020}$.. Find the value of f(-1000)

View Text Solution

5. Let $\vec{a}$, $\vec{b}$ and $\vec{c}$ be three unit vectors such that $\vec{a}$ is perpendicular to the plane of $\vec{b}$ and $\vec{c}$. if the angle between $\vec{b}$ and $\vec{c}$ is $\frac{\pi}{3}$, then $\left|\vec{a} \times \vec{b} - \vec{a} \times \vec{c}\right|^2$ is equal to

View Text Solution

6. If

$$\lim_{n \to \infty} \frac{1^a + 2^a + \ldots + n^a}{(n+1)^{a-1}[(na+1) + (na+2) + \ldots + (na+n)]} = \frac{1}{60}, a > 0,$$

, then find the value of a.

View Text Solution

7. In ΔABC ex-radii $r_A = 5, r_B = 3$ and $\angle C = \frac{\pi}{2}$. If Δ, s, r represent area, perimeter and in-radius of the triangle respectively then evaluate $\Delta + c + s - r.$

View Text Solution

8. In $\Delta ABC, b + c = 3a$, evaluate $\cot\left(\frac{B}{2}\right)\cot\left(\frac{C}{2}\right)$

View Text Solution

9. A batsman scores 38, 76, 34, 48, 44, 54, 46, 55, 63, 42 runs in 10 innings.

Find the value of mean deviation about the median.

View Text Solution

10. Find the number of integral values of x satisfying the inequation: $\frac{x}{x+2} \leq \frac{1}{|x|}$.

View Text Solution