MATHS

BOOKS - NTA MOCK TESTS

NTA TPC JEE MAIN TEST 102

Mathematics

1. Find k if

$$\sum_{i=0}^{100} {}^{150}C_i . {}^{350}C_{100-i} . (150 - i) = k . {}^{500}C_{100}$$

A. 50

B. 100

C. 120

D. 150

Answer: C

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2. If the centre, one of the foci and semimajor axis of an ellipse be (0,0), (0,3) and 5 respectively, then its equation is

A. $\frac{x^2}{16} + \frac{y^2}{25} = 1$

B. $\frac{x^2}{25} + \frac{y^2}{16} = 1$

C. $\frac{x^2}{9} + \frac{y^2}{25} = 1$

D. None of these

Answer: A

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3. The proposition $\sim(p \vee q) \vee ((\sim p) \wedge q)$ is logically equivalent to

A. $\sim p$

B. p

C. q

D. $\sim q$

Answer: A

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4. If $A + B + C = \pi$, then the value of

$$\begin{vmatrix} \sin(A+B+C) & \sin B & \cos C \\ -\sin B & 0 & \tan A \\ \cos(A+B) & -\tan A & 0 \end{vmatrix}$$ equal to.

A. 0

B. 1

C. $2 \sin B \tan A \cos C$

D. None of these

Answer: A

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5. In a class of 55 students, the number of students studying different subjects are 23 in Mathematics, 24 in Physics,19 in Chemistry, 12 in Mathematics and Physics, 9 in Mathematics and Chemistry, 7 in Physics and Chemistry and 4 in all the three subjects. The number of students who have taken exactly one subject is

A. 6

B. 9

C. 7

D. 22

Answer: D

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6. If e_1 is the eccentricity of the ellipse $\frac{x^2}{16}+\frac{y^2}{25}=1$ and e_2 is the eccentricity of the hyperbola passing through the foci of the ellipse and $e_1e_2=1$, then the equation of the hyperbola is

A. $\frac{x^2}{9}-\frac{y^2}{16}=1$

B. $\frac{x^2}{16}-\frac{y^2}{9}=-1$

C. $\frac{x^2}{9}-\frac{y^2}{25}=1$

D. None of these

Answer: B

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7. Let S_n denotes the sum of n terms of S30 an arithmetic progression, then $\frac{S_{30}}{S_{20} - S_{10}}$ is equal to

A. 3

B. 2

C. 1

D. depends upon first term &common difference of

A. P

Answer: A

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8. An elevator starts with m passengers and stops at n floors $(m \leq n)$. The probability that no two passengers left it at the same floor is

A. $\frac{{}^{n}P_{m}}{m^{n}}$

B. $\frac{{}^{n}P_{m}}{n^{m}}$

C. $\frac{{}^{n}C_{m}}{m^{n}}$

D. $\frac{{}^{n}C_{m}}{n^{m}}$

Answer: B

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9. The equation of the plane, such that image of point (1,2,3) in the plane is (1,-4,1)is

A. $x + y + z - 1 = 0$

B. $x + y + z + 1 = 0$

C. $3y + z + 1 = 0$

D. $3y + z - 1 = 0$

Answer: C

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10. The set of values of p for which the points of extrema of the function,

$f(x) = x^3 - 3px^2 + 3(p^2 - 1)x + 1$ lie in the interval (-2,4) is:

A. $(-3, 5)$

B. $(-3, 3)$

C. $(-1, 3)$

D. $(-1, 5)$

Answer: C

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11. If $Z_1 \neq 0$ and Z_2 be two complex numbers such that $\frac{Z_2}{Z_1}$ is a purely Z1 imaginary number, then $\left|\frac{2Z_1 + 3Z_2}{2Z_1 - 3Z_2}\right|$ is equal to

A. 2

B. 5

C. 3

D. 1

Answer: D

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12. The value of

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

is equal to

A. $\frac{1}{2}$

B. $\frac{-1}{2}$

C. $\frac{1}{3}$

D. $\frac{-1}{3}$

Answer: D

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13. If $f(x) = \lim_{n \to 00} \frac{\left(x^2 + ax + 1\right) + x^{2n}\left(2x^2 + x + b\right)}{1 + x^{2n}}$ is continuous for all x $\in$ R, then a +b is equal to

A. 0

B. 1

C. 2

D. 3

Answer: B

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14. If $\int e^{x^2}\left(2-\frac{1}{x^2}\right)dx = e^{x^2}f(x)$ then $+C$ and $f\left(\frac{1}{2}\right)=2$

find f (1): (where C is an arbitrary constant)

A. 1

B. -1

C. 2

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

Answer: A

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15. From any arbitrary point P on the line +y = 4, tangents PA and PB are drawn to the circle $x^2 + y^2 = 8$. Find the equation that satisfies the locus of the midpoint of AB.

A. $x^2 + y^2 + 2x + 2y = 0$

B. $x^2 + y^2 - 2x - 2y = 0$

C. $x^2 + y^2 - 2x + 2y = 0$

D. $x^2 + y^2 + 2x - 2y = 0$

Answer: B

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16. The area bounded by the parabola

$y = 4x^2, x = 0$ and $y = 1, y = 4$ is

A. 7

B. $\frac{7}{2}$

C. $\frac{7}{3}$

D. $\frac{7}{4}$

Answer: C

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17. The solution of the equation

$\tan^{-1} 2x + \tan^{-1} 3x = \frac{\pi}{4}$ would be :

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

B. 1

C. -1

D. $\frac{-1}{6}$

Answer: A

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18. Locus of image of point (2, 3) about the line $(x+y+7)+k(x+2y+9)=0$(k is a non-zero real number) is

A. straight line

B. circle with radius $= \sqrt{34}$

C. ellipse whose e $= \frac{2}{3}$

D. hyperbola whose $e = \sqrt{2}$

Answer: B

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19. The differential equation

$\frac{xdy}{ydx} + \frac{\sin(y) + \cos(x)\ln y^x}{\sin(x) + \cos(y)\ln x^y} = 0$ has general solution as

(Where C is constant of integration)

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

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

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

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

Answer: D

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20. For natural number n, $2^n(n-1)! < n^n$, if

A. $n < 2$

B. $n > 2$

C. $n \geq 2$

D. Never

Answer: B

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21. If $2x = y^{\frac{1}{3}} + y^{\frac{-1}{3}}$ and $\left(x^2 - 1\right)\frac{d^2y}{dx^2} + x\frac{dy}{dx} + ky = 0,$ then find the value of k.

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22. Find the number of ways of distributing 11 pencils among 6 kids, each one receiving at least one.

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23. A function f is defined as $f(x) = \frac{1}{2}\left(\frac{|\sin x|}{\cos x} + \frac{\sin x}{|\cos x|}\right)$. If the fundamental period of function f is $m\pi$, then the value of m is

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24. Consider $\hat{a}$ and $\hat{b}$ be two unit vectors such that $\hat{a} + \hat{b}$ is also a unit vector. If the angle between $\hat{a}$ and $\hat{b}$ is $p\pi$ then k is equal to _____

A. `

B.

C.

D.

Answer: 0.67

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25. Find the value of

$$\int_{-\frac{\pi}{3}}^{\frac{\pi}{4}} \left(\frac{x^{11} - 3x^9 + 5x^7 - x^5 + 1}{\cos^2 x} \right) dx.$$

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26. Let $\pi < \alpha < \frac{3\pi}{2}$. Evaluate the expression

$$\sqrt{4\sin^4\alpha + \sin^2 2\alpha} + 4\cos^2\left(\frac{\pi}{4} - \frac{\alpha}{2}\right)$$

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27. Given that 4 cos x cos y = 1 and $\sin^2 x + \sin^2 y \geq \frac{3}{2}$. Evaluate $\tan^2 x + \tan^2 y$

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28. If a variable takes values 0, 1, 2, 3, 4, 5 with frequencies

$5_{C0}, 5_{C1}, 5_{C2}, 5_{C3}, 5_{C4}$ and 5_{C5} respectively then evaluate A. M.

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29. If equations

$x^2 + ax + b = 0(a, b \neq R)\&x^3 + 3x^2 + 5x + 3 = 0$

have two common roots, then value of $\frac{b}{a}$ is equal to

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