MATHS

BOOKS - NTA MOCK TESTS

NTA TPC JEE MAIN TEST 94

Mathematics

1. A cubic polynomial $f(x) = x^3 + px^2 + qx + 72$ is divisible by both $x^2 + ax + b$ and $x^2 + bx + a$ (where a,b, p,q are constants and $a \neq b$), then the sum of the squares of roots of the cubic polynomial is:

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2. The two consecutive terms in the expansion of $(3 + 2x)^{74}$ whose coefficients are equal, is/are

A. 30th and 31st terms

B. 29th and 30th terms

C. 31st and 32nd terms

D. 28th and 29th terms

Answer: A

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3. If a circle of radius r is concentric with ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$, then the common tangent is inclined to major axis at an angle

A. $\tan^{-1}\sqrt{\frac{r^2b^2}{a^2-r^2}}$

B. $\tan^{-1}\sqrt{\frac{r^2-a^2}{b^2-r^2}}$

C. $\tan^{-1}\sqrt{\frac{r^2-b^2}{r^2-a^2}}$

D. $\tan^{-1}\sqrt{\frac{r^2-a^2}{r^2-b^2}}$

Answer: A

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4. If two statements are given as p : Ram is smart, q : Ram is intelligent

Then, the symbolic form of Ram is smart and intelligent, is:

A. $(p \wedge q)$

B. $(p \vee q)$

C. $(p \wedge \sim q)$

D. $(p \vee \sim q)$

Answer: A

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5. If $A = [a_{ij}]_{3\times 3}$, such that $a_{ij} = \begin{vmatrix} 2 & i = j \\ 0 & i \neq j \end{vmatrix}$, then $\log_{\frac{1}{2}}\left(|A|^{\text{adj A}}\right) + 1$ is equal to:

A. -191

B. 193

C. -23

D. 25

Answer: A

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6. If $\log_{175}(5x) = \log_{243} 7x$, then the value of $\log_{42}\left(x^4 - 2x^2 + 7\right)$ is equal to:

A. 1

B. 2

C. 3

D. 4

Answer: A

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7. In an infinite progression, each term equal to the 3 times of sum of next all terms. Then the common ratio of the G.P. Is:

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

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

C. $\frac{1}{4}$

D. $\frac{2}{3}$

Answer: C

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8. From a pack of 52 cards two cards are drawn at random. The probability of both cards being spade is:

A. $\frac{1}{17}$

B. $\frac{2}{17}$

C. $\frac{3}{17}$

D. $\frac{1}{15}$

Answer: A

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9. The line $\frac{x-3}{2} = \frac{y-4}{5} = \frac{z-6}{7}$

A. lies in 3x + 5y + 2z - 6 = 0

B. is parallel to 2x - by + 3z = 9

C. is perpendicular to 2x- 5y + 3z - 9 = 0

D. passing through (2,3,5)

Answer: B

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10. Let $f(x) = 2x + \cot^{-1} x + \ln\left(\sqrt{1+x^2} - x\right)$. Then f(x)

A. increases in $(-\infty, \infty)$

B. decreases in $(-\infty, \infty)$

C. neither increases nor decreases in $(0, \infty)$

D. increases as well as decreases in $(-\infty, \infty)$

Answer: A

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11. Let z_1 and z_2 are two complex numbers such that $|z_1| = |z_2|$ and $arg(z_1) + \arg(z_2) = \pi$, then z_1 equals to:

A. z_2

B. $-z_2$

C. $\overline{z_2}$

D. $-\overline{z_2}$

Answer: D

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12. $\lim_{x \to 1} \frac{1 - \cos\left(4\cos^{-1} x\right)}{1 - x^2}$ is equal to:

A. 4

B. 8

C. 16

D. 32

Answer: B

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13. If $f(x) = \begin{vmatrix} \frac{1-|x|}{1+x} & x \neq -1 \\ 1 & x = -1 \end{vmatrix}$, then the value of f(|2k|) will be (where [•] shows the greatest integer function]

A. continuous at $x = -1$

B. continuous at x = 0

C. discontinuous at $x = \frac{1}{2}$

D. all of these

Answer: D

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14. $\int \frac{dx}{\cos x - \sin x}$ is equal to:

A. $\frac{1}{\sqrt{2}} \log \left| \tan \left(\frac{x}{2} - \frac{3\pi}{8} \right) \right| + C$

B. $\frac{1}{\sqrt{2}} \log \left| \cot \left(\frac{x}{2} \right) \right| + C$

C. $\frac{1}{\sqrt{2}} \log \left| \tan \left(\frac{x}{2} - \frac{\pi}{8} \right) \right| + C$

D. $\frac{1}{\sqrt{2}} \log \left| \tan \left(\frac{x}{2} \right) + \frac{3\pi}{8} \right| + C$

Answer: D

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15. Find the equation of the circle whose center lies on Zx + 4y = 7 and which passes through the points (1, - 2) and (4, - 3).

A. $15\left(x^2+y^2\right)-90x18y+50=0$

B. $x^2+y^2-94x+18y+55=0$

C. $15\left(x^2+y^2\right)-94x+18y+55=0$

D. $15\left(x^2+y^2\right)+94x+18y+55=0$

Answer: C

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16. The area of the region for which $0<y<3-2x-x^2$ and $x>0$ is:

A. $\frac{5}{3}$

B. 3

C. $\frac{13}{3}$

D. 9

Answer: A

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17. If $5\cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)+7\sin^{-1}\left(\frac{2x}{1+x^2}\right)-4\tan^{-1}\left(\frac{2x}{1-x^2}\right)-\tan^{-1}x=$, then x is equal to,

A. $-\sqrt{3}$

B. $\sqrt{2}$

C. 2

D. $\sqrt{3}$

Answer: D

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18. If the price of three items of furniture is in the ratio of $3:5:7$ and the average price of the items of furniture is Rs 15000, then the price of the cheapest item is:

A. Rs 9000

B. Rs 15000

C. Rs 18000

D. Rs 21000

Answer: A

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19. The maximum area of the triangle formed by joining the points $\left(1, \sqrt{3}\right), \left(-1, -\sqrt{3}\right)$ and $(2\cos\theta, 2\sin\theta)$ is:

A. 2

B. 4

C. 8

D. $4\sqrt{3}$

Answer: B

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20. If the differential equation is: $\frac{dy}{dx} = \frac{x}{y(x^2 + y^2 - 1)}$, then the value of $x^2 + y^2$ is equal to (where c is constant of integration)

A. ce^{x^2}

B. ce^{y^2}

C. ce^{-x^2}

D. ce^{-y^2}

Answer: B

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21. The roots of the given equation: $(p-q)x^2+(q-r)x+(r-p)=0$ are

A. $\frac{p-q}{r-p}, 1$

B. $\frac{q-r}{p-q}, 1$

C. $\frac{r-p}{p-q}, 1$

D. None of these

Answer: C

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22. Let $F(x)=\int_0^{x^2+\frac{\pi}{3}} 2\cos^2 t dt, x \in R$ and $f: \left[0, \frac{1}{2}\right] \to [0, \infty)$ be a continuous function. For $a \in \left[0, \frac{1}{2}\right]$, If $F'(a)+2$ is the area of the region bounded by$y=f(x), x=0, y=0$ and x=a, then find f(0).

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23. If number of straight line formed by 10 points (no three of them are collinear) = $\sum_{r=0}^{m-3} {}^{m}C_r {}^{m}C_r {}^{m}C_{r+3}$ then value of $\frac{1}{m}$ is equal to:

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24. If the system of equations $x + ay = 0, az + y = 0, ax + z = 0$ and has infinitely many solutions for real some value of a and $a = (\lambda - 4)$ then the value of λ is:

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25. P is a point on the parabola whose ordinate equal to its abscissa. A normal is drawn to the parabola at P to meet it again at Q. If S is the focus of the parabola, then find the product of the slopes of SP and SQ.

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26. A line passing through the origin meets the circle $x^2 + y^2 = a^2$ and the hyperbola $x^2 - y^2 = a^2$ at Pand Q respectively. Then locus of the point of intersections of tangent to the circle at P with the tangent at Q to the hyperbola is the curve given by the equation $\left(a^4 + 4y^4\right)x^2 = a^k$ then the value of k is equal to:

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27. A vector $\left(a\hat{i} + b\hat{j} + c\hat{k}\right)$ is rotated through a certain angle about the origin in the anti-clockwise direction. If the new vector obtained is: $(a-1)\hat{k} + (b-1)\hat{j} + (c-1)\hat{k}$, then find the value of: $2(a+b+c)$

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28. Let I(n) = $\int_1^e x^3, (\ln x)dx$, where $n \in N$. Find the value of ln(4I(5) + 5I(4))

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29. If sin A + cos A = m and $\sin^3 A + \cos^3 A = n$, then evaluate $m^3 - 3m + 2n$

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30. $0 \leq x_1 < x_2 < \pi$ satisfy $1 + \sin x + \sin^2 x + \ldots . X = 4 + 2\sqrt{3}$. Find $|[x_1 - x_2]|$ (where [•] represents greatest integer function.)

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31. If $n(A) = 10, n(A \cap B) = 4$, then how many elements are in $(A \cap B)' \cap A$

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