MATHS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 94

Mathematics

1. Consider the cubic $f(x) = x^3 - 3x + a$ where $a \in (0, 2)$. Then, the equation $f(x) = 0$ has

A. 3 real solutions

B. 2 real solutions

C. 1 real solutions

D. no real solutions

Answer: A

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2. The integral $I = \int \frac{\sin^3\theta \cos\theta}{\left(1+\sin^2\theta\right)^2} d\theta$ simplifies to (where, c is the constant of

integration)

A. $\frac{1}{2}\ln(\sin\theta) + \frac{1}{1+\sin^2\theta} + c$

B. $\frac{1}{2}\ln\left(1+\sin^2\theta\right) + \frac{1}{1+\sin^2\theta} + c$

C. $\ln(\sin\theta) + \frac{1}{1+\sin^2\theta} + c$

D. $\ln\left(\sin^2\theta+1\right) + \frac{1}{\sin^2\theta+2} + c$

Answer: B

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3. For how many values of 'x' in the closed interval $[-4, -1]$ is the matrix $\begin{bmatrix} 3 & -1+x & 2 \\ 3 & -1 & x+2 \\ x+3 & -1 & 2 \end{bmatrix}$ singular ?

A. 1

B. 3

C. 4

D. 5

Answer: A

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4. Consider the function $f(x) = \cos^{-1}([2^x]) + \sin^{-1}([2^x] - 1)$, then (where $[.]$ represents the greatest integer part function)

A. the domain of $f(x)$ is $x \in (-\infty, 0]$

B. the range of $f(x)$ is singleton

C. $f(x)$ is an even function

D. `f(x) is an odd function

Answer: B

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5. Consider three statements

p : person 'A' passed in mathematics exam

q : Person 'A' passed in physics exam

r : Person 'A' passed in chemistry exam,

Then the statement

$-((-(p \Rightarrow q)) \Rightarrow r)$ is equivalent to

A. Person A passed only in mathematics among mathematics, physics and chemistry.

B. Person B failed only in physics among mathematics, physcis and chemistry.

C. Person A passed in all the three subjects mathematics and physics and chemistry.

D. Person A passed in chemistry but failed in mathematics and physics.

Answer: B

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6. If $f(x)$ is continuous in $[0, 1]$ and $f\left(\frac{1}{3}\right) = 12$, then the value of $\lim_{n \to \infty} f\left(\frac{\sqrt{n}}{3\sqrt{n}+1}\right)$ is equal to

A. 2

B. 3

C. 12

D. None of these

Answer: C

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7. For $x \in \left(\frac{-\pi}{2}, \frac{\pi}{2}\right)$, the range of values of values of $f(x) = 2 + \sin x + \sin^3 x + \sin^5 x \ldots\ldots \infty$

A. $(0, 1)$

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

C. $(-2, 2)$

D. None of these

Answer: B

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8. A biased coin is tossed 10 times. The head is 2 times more likely to appear than the tail. The probability that 2^{nd} tail and 4^{th} tail occur at 4^{th} and 10^{th} tosses respectively is

A. $\frac{16}{3^9}$

B. $\frac{320}{3^{10}}$

C. $\frac{320}{3^9}$

D. $\frac{160}{3^{10}}$

Answer: C

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9. If the line $\frac{x-4}{1} = \frac{y-2}{1} = \frac{z-m}{2}$ lies in the plane $2x + ly + z = 7$, then the value of $m + 2l$ is equal to

A. 1

B. 2

C. -1

D. -2

Answer: C

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10. The least positive integral value of k for which $\begin{bmatrix} \cos.\frac{2\pi}{7} & -\sin.\frac{2\pi}{7} \\ \sin.\frac{2\pi}{7} & \cos.\frac{2\pi}{7} \end{bmatrix}^k = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ is

A. 0

B. 3

C. 7

D. 14

Answer: C

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11. The solution of the differential equation $x dx + y \sin^2 x dy = y dy + x \sin^2 y dx$ is

(where, c is an arbitrary constant)

A. $x \tan x = \sec y + c$

B. $x \tan y = \sec x + c$

C.

$$x \tan x - \ln|\sec x| = y \tan y - \ln|\sec y| + c$$

D. $x \tan x = \ln|\sec y| + c$

Answer: C

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12. There are fifty persons among whom 2 are brothers. The number of ways they can be arranged in a circle, if there is exactly one person between the two brothers, is

A. $2 \times 48!$

B. 12

C. 360

D. $7 \times 8!$

Answer: A

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13. The product of the roots of the equation whose roots are greater by unity than the equation $x^3 - 5x^2 + 6x - 3 = 0$ is equal to

A. 3

B. 12

C. 15

D. 18

Answer: C

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14. The focal chord of $y^2 = 64x$ is tangent to $(x-4)^2 + (y-2)^2 = 4$, th en the square

root of the length of this focal chord is equal to

A. $\frac{74}{9}$

B. $\frac{37}{3}$

C. $\frac{74}{3}$

D. $\frac{37}{9}$

Answer: C

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15. If

$$\frac{(1+\cos 2x)}{\sin 2x}+3\left(1+(\tan x)\tan.\ \frac{x}{2}\right)\sin x=4$$

then the value of $\tan x$ can be equal to

A. 2

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

C. 3

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

Answer: D

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16. Let $0 < \theta_1 < \theta_2 < \theta_3 < \ldots\ldots\ldots$ denotes the positive solutions of the equation $3 + 3\cos\theta = 2\sin^2\theta$. If $\theta_3 + \theta_7 = a\pi$, where a is an integer, then the value of a is equal to

A. 6

B. 7

C. 8

D. 4

Answer: A

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17. If the point $P\left(\frac{3a}{2}, 1\right)$ lies between the two different lines $x + y = a$ and $x + y = 2a$, then the least integral value of $|a|$ is equal to

A. 1

B. 2

C. 3

D. 4

Answer: C

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18. 50th term of the sequence $3 + 12 + 25 + 42 +$ is 5145 b. 5148 c. 5142 d. 5195

A. 5145

B. 5148

C. 5142

D. 5195

Answer: B

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19. A hyperbola having the transverse axis of length $\sqrt{2}$ units has the same focii as that of ellipse $3x^2 + 4y^2 = 12$, then its equation is

A. $2x^2 - 2y^2 = 1$

B. $2x^2 - 2y^2 = 3$

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

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

Answer: A

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20. An insect starts from the origin in the argand plane and goes 4 km $(N45^\circ E)$ then it moves 3 km $(N45^\circ W)$ and then takes an angular movement of $\frac{\pi}{3}$ about origin in the anticlockwise direction. The final position of the insect is

A. $(4-3i)e^{\frac{-5\pi}{6}}$

B. $(4+3i)e^{\frac{-5\pi}{6}}$

C. $(4-3i)e^{\frac{i3\pi}{4}}$

D. $(4+3i)e^{\frac{-7\pi}{12}}$

Answer: D

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21. If the area enclosed by $y^2 = 2x$ and $x^2 + 4 + 4x = 4y^2$ is k square units, then the value of 3k is equal to

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22. If $\lim_{x \to 0} \left(1 + px + qx^2\right)^{\text{cosec } x} = 2048$, then the value of $\frac{p}{11}$ is equal to (take $\ln 2 = 0.69$)

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23. Let $\overrightarrow{PR} = 3\hat{i} + \hat{j} - 2\hat{k}$ and $\overrightarrow{SQ} = \hat{i} - 3\hat{j} - 4\hat{k}$ represent the diagonals of the parallelogram PQRS. If $\overrightarrow{PT} = 2\hat{i} - \hat{j} + \hat{k}$ is another vector, then the volume (in cubic units) of the

parallelepiped formed by the vectors $\overrightarrow{PT}, \overrightarrow{PQ}$ and $\overrightarrow{PS}$ is

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24. The value of the expression $\Sigma_{k=0}^{27} k.^{27} C_k \left(\frac{1}{3}\right)^k \left(\frac{2}{3}\right)^{27-k}$ is equal to

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25. Let P and Q be 2 circles externally touhing each other at point X. Line segment AB is a

direct common tangent to circle P and Q at points A and B respectively. Another common tangent to P and Q at X intersects line AB at a point Y. If BY = 10 units and the radius of P is 9 units, then the value of the reciprocal of the radius of the radius of the circle Q is equal to

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