MATHS

BOOKS - NTA MOCK TESTS

NTA TPC JEE MAIN TEST 48

Mathematics

1. The sum of rational terms in the binomial expansion of $\left(\sqrt{2}+\sqrt[5]{3}\right)^{10}$ is

A. 32

B. 41

C. 25

D. None of these

Answer: B

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2. If $z = \dfrac{3}{2 + \cos\theta + i\sin\theta}$, then locus of z is :

A. a straight line

B. a circle having centre on x-axis

C. a circle having centre on y-axis

D. a parabola

Answer: B

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3. $\begin{vmatrix} 5\sqrt{\log_5 3} & 5\sqrt{\log_5 3} & 5\sqrt{\log_5 3} \\ 3^{-\log_{1/3}(4)} & (0.1)^{\log_{0.01}(4)} & 7^{\log_7(3)} \\ 7 & 3 & 5 \end{vmatrix}$ is

A. 0

B. $5\sqrt{\log_5 3}$

C. $2.5\sqrt{\log_5 3}$

D. None of these

Answer: A

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4. The variance of first five prime numbers is

A. 10

B. 3.2

C. 10.24

D. None of these

Answer: C

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5. If $x^2 - 2x + 2\sin\alpha = 0$ has unique root in $(-1, 1)$, then length of largest continuous interval of α in $[0, 2\pi]$ is

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

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

C. $\frac{5\pi}{6}$

D. $\frac{7\pi}{6}$

Answer: D

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6. If $x^2 + y^2 + z^2 = 1$, where $x, y, z \in R^+$, then greatest value of $x^2y^2z^4$ is

A. $\frac{2^5}{3^{\frac{15}{2}}}$

B. $\frac{2^{10}}{3^{15}}$

C. $\frac{2^{10}}{3^{\frac{9}{3}}}$

D. $\frac{2^{15}}{3^9}$

Answer: A

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7. If $A=\{\theta: 2\cos^2\theta+\sin\theta\leq 2\}$ and $B=\left\{\theta: \frac{\pi}{2}\leq\theta\leq\frac{3\pi}{2}\right\}$. Then , $A\cap B$ is equal to

A. $\{\theta: \pi/2\leq\theta\leq 5\pi/6\}$

B. $\{\theta: \pi\leq\theta\leq 3\pi/2\}$

C. $\{\theta: \pi/2\leq\theta\leq 5\pi/6\}\cup\{\theta: \pi\leq\theta\leq 3\pi/2\}$

D. None of the above

Answer: C

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8. From a point $(h, 0)$ common tangent s are drawn to circles $x^2 + y^2 = 1$ and $(x - 2)^2 + y^2 = 4,$ value of h is

A. 2

B. -2

C. $-\frac{2}{3}$

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

Answer: B

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9. P (6,3) is a point on the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1.$ If the normal at point P intersect the x-axis at (10,0) , then the eccentricity of the hyperbola is

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

B. $\frac{\sqrt{13}}{3}$

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

D. $\frac{\sqrt{13}}{2}$

Answer: A

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10. The coordinates of the point on the parabola $y^2 = 8x$, which is at minimum distance from circle $x^2 + (y-6)^2 = 1$ are

A. $(2, 14)$

B. $(12, 18)$

C. $(2, 4)$

D. $(4, 2)$

Answer: C

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11. The angle between the tangents to the curve $y = x^2 - 5x + 6$ at points (2,0) and (3,0) is

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

B. $\frac{\pi}{4}$

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

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

Answer: D

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12. If a plane passes through the point $(1, 1, 1)$ and is perpendicular to the line $\frac{x-1}{3} = \frac{y-1}{0} = \frac{z-1}{4}$, then its perpendicular distance from the origin is -

A. $\frac{3}{4}$

B. $\frac{4}{3}$

C. $\frac{7}{5}$

D. 1

Answer: C

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13. If $\vec{r} = \hat{i} + \hat{j} + \hat{k}$ and $\vec{r}_1 \left(a\hat{i} + b\hat{j} + c\hat{k}\right)$ where $a, b, c \in \{-3, -2, -1, 0, 1, 2, 3, 4\}$, then number of possible non-zero vector $\vec{r}_1$ perpendicular to $\vec{r}$ is

A. 45

B. 55

C. 46

D. none of these

Answer: A

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14. Let $f: R \to R$ be a differentiable function such that

$f(1) = 1, f(2) = 20, f(-4), \text{ and } f'(0) = 0$

$f(x+y) = f(x) + f(y)$

$+3xy(x+y) + bxy + c(x+y)$

$+4 \forall x, y \in R$

where b, c are constants, then number of solutions of the equation

$f(x) = x^3 + 4e^x$ is equal to

A. 0

B. 1

C. 2

D. 3

Answer: B

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15. If $f(x) = \max\{\sin x, \sin^{-1}(\cos x)\}$, then

A. f is differentiable everywhere

B. f is continuous everywhere but not differentiable

C. f is discontinuous at $x = \frac{n\pi}{2}, n \in I$

D. f is non-differentiable at $x = \frac{n\pi}{2}, n \in I$

Answer: B

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16. Let $y = f(x)$ be function satisfying the differential equation $x\frac{dy}{dx} + 2y = 4x^2$ and $f(1) = 1$ then $f(-3)$ is equal to

A. 9

B. -3

C. 0

D. 3

Answer: A

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17. If $\int \frac{2\cos x + 3\sin x}{3\cos x + 4\sin x} dx = Ax + B\ln|3\cos x + 4\sin x| + C$ then (A +B) is equal to

A. $\frac{18}{25}$

B. $\frac{19}{25}$

C. $\frac{17}{25}$

D. $\frac{4}{5}$

Answer: C

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18. A ladder rests against a wall at an acute angle α to the horizontal. Its foot is pulled away form the wall through a distance 2 m, so that it slides a distance 3 m down the wall making an acute angle β with the horizontal , then the value of $\tan\left(\frac{\alpha+\beta}{2}\right)$ is

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

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

C. $\frac{4}{9}$

D. $\frac{9}{4}$

Answer: B

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19. If latus rectum of the ellipse $x^2\tan^2\alpha+y^2\sec^2\alpha=1$ is $\frac{1}{2}$, where $0<\alpha<\pi$ ten eccentricity 'e' can be

A. $\frac{\sqrt{3}+1}{2\sqrt{2}}$

B. $\frac{\sqrt{3}}{2\sqrt{2}}$

C. $\frac{1}{2\sqrt{2}}$

D. none of these

Answer: A

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20. Let

$f(\alpha) = \sin^{-1}(\sin\alpha) + \cos^{-1}(\cos\alpha)$ and $g(\beta) = \sin^{-1}(\sin\beta) + \tan^{-1}(\text{ta}$

then the value of $(100) + g(8)$ is

A. 0

B. 8

C. 100

D. 108

Answer: A

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21. Let p be a matrix of order 3×3 such that all the entries in p are form the set $\{-1, 0, 1\}$. Then, the maximum possible value of the determinant of p is

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22. Find the value of $f^2(4) + g^2(4)$, if $f'(x) = g(x)$ and $g'(x) = -f(x)$ for all x and $ff(2) = 4 = f'(2)$.

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23. The value of integral part of

$\int_0^2 [x^2 - x + 1] dx$ is : (where [.] denotes greatest integer function)

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24. How many real solutions does the equation $2\sin = x^2 = x\pi + \frac{\pi^2 + 8}{4}$ have ?

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25. Let f (x) be a function continuous for all except at x =0 such that

$f'(x) > 0 \forall x > 0$ and $f'(x) < 0 \forall x < 0$.

If $\lim_{x \to 0^+} f(x) = 10$, $\lim_{x \to 0^-} f(x) = 15$ and $f(0) = 12$, then $\frac{\lim_{x \to 0} f(x^3 - x^2)}{\lim_{x \to 0} f(2x^4 - x^5)} + \frac{\lim_{x \to 0} [f(x^3 - x^2)]}{\lim_{x \to 0} [f(2x^4 - x^5)]} =$

[.] denotes greatest integer Function)

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26. Let $f: R \to R, y = f(x)$ be a differentible function satisfying the equation $\frac{dy}{dx} = (2 + 5y)(5y - 2)$ and $f(0) = 0$, then $\lim_{x \to -\infty} f(x) =$ ....

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27. Let the set S_n is defined as follows

$S_1 = \{1\}, S_2 = \{2, 3, 4\},$

$S_3 = \{5, 6, 7, 8, 9\}\ldots.\ .,$ for each positive integer n. If the sum of all the integers in set S_n is equal to 1729, then the number of elements in set S_n is equal to

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28. If $\frac{d}{dx}\left(\frac{1+x^4+x^8}{1+x^2+x^4}\right) = ax^3 + bx,$ then find the value of a + b.

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29. Let y be the product of all the divisors of the number 720. If y is divisible by $15^p,$ then maximum value of $\left(\frac{p}{3}\right)$ equals

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