MATHS

BOOKS - NTA MOCK TESTS

NTA TPC JEE MAIN TEST 113

Mathematics

1. Let $y = f(x)$ be a bijective function and $y = g(x)$ be a function such that $g(x) = f^{-1}(x)$. Let $y = h(x)$ be a function defined as

$h(x) = xf(x) + g(x)$. IF $y = f(x)$ and $y = g(x)$ be differentiable function $f(1) = 2, f'(1) = 2$ and $f(3) = f'(3) = 1$ then h'(1)equals

A. 3

B. 2

C. 5

D. $\frac{9}{2}$

Answer: C

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2. The normal at the point $\left(bt_1^2, 2bt_1\right)$ on a parabola meets the pparabola again in the point $\left(bt_2^2, 2bt_2\right)$ then

A. $t_2 = -t_1 + \frac{2}{t_1}$

B. $t_2 = t_1 - \frac{2}{t_1}$

C. $t_2 = t_1 + \frac{2}{t_1}$

D. $t_2 = -t_1 - \frac{2}{t_1}$

Answer: D

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3. The negation of the proposition $(\pi mplies \sim q) \wedge (q \Rightarrow \sim p)$ is

A. $p \wedge q$

B. $p \vee q$

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

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

Answer: A

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4. If α, β, γ are the roots of $x^3 + ax^2 + b = 0$

then the determinant $\Delta = \begin{vmatrix} \alpha & \beta & \gamma \\ \beta & \gamma & \alpha \\ \gamma & \alpha & \beta \end{vmatrix}$ equals

A. $-a^3$

B. $a^3 - 3b$

C. $a^2 - 3b$

D. a^3

Answer: D

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5. The domain of the function $f(x) = \exp\left(\sqrt{5x - 3 - 2x^2}\right)$ is

A. $[3/2, \infty)$

B. $[1, 3/2]$

C. $(-\infty, 1]$

D. $(1, 3/2]$

Answer: B

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6. The number of non empty subsets of the set

{1,2,3,4} I

A. 15

B. 14

C. 16

D. 17

Answer: A

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7. The product of the length of the perpendiculars from the two foci on any tangent to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is

A. a^2

B. $2a^2$

C. b^2

D. $2b^2$

Answer: C

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8. One percent of the population suffers from a certain disease. There is blood test for this disease, and it is 99% accurate, in other words, the probability that it gives the correct anwer is 0.99, regardless of whether the person is sick or healthy. A person takes the blood test, and the result says that he has the disease. The probability that he actualy has the disease is

A. $0.99\ \%$

B. $25\ \%$

C. $50\ \%$

D. $75\ \%$

Answer: C

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9. If a line passing through (-2,1,b) and (4,1,2) is perpendicular to the vector $\hat{i}+3\hat{j}-2\hat{k}$ and is parallel to the plane containing the vectors $\hat{i}+c\hat{k}$ and $c\hat{j}+b\hat{k}$, then ordered pair (b,c) can be

A. $\left(-1, \frac{-1}{2}\right)$

B. $(1, -6)$

C. $(-1, 0)$

D. $\left(1, \frac{1}{2}\right)$

Answer: C

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10. Consider the A(-1,2,1) and B(4,3,5) are two given points. Then the projectio of AB on a line which makes agle 120°, and 135° with Y and Zaxis respectively and an acute angle with X-axis is

A. $(2-2\sqrt{2})$units

B. $(2+2\sqrt{2})$ units

C. $(2+3\sqrt{2})$ units

D. $(2+\sqrt{2})$ units

Answer: A

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11. The value of

$$\lim_{x \to \pi/6} \left(4 - 3\sin x - 2\cos^2 x\right)^{\frac{1}{2\sin x - 1}}$$ is

A. 1

B. 6

C. $\sqrt{e}$

D. $e^{-1/2}$

Answer: D

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12. If $x \in R^{+}$ and $n \in N$, we can uniquely write $x = mn + r$ where $m \in W$ and $0 \leq r < n$. We define x mod n=r for example 10.3 mod 3.1.3. The number of points of discontinuty of the function $f(x) = (x \bmod 2)^2 + (x \bmod 4)$ in the interval $0 < x < 9$ is

A. 0

B. 2

C. 4

D. None of these

Answer: C

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13. For $x \geq -1$, let $f(x) = \int_0^{\pi/4} \log_e(1 + x \tan z) dz$. Then value of $f\left(\frac{1}{2}\right) - f\left(\frac{1}{3}\right)$ equals

A. $\frac{\pi}{4} \log_e\left(\frac{9}{8}\right)$

B. $\frac{\pi}{8} \log_e\left(\frac{9}{8}\right)$

C. $\frac{\pi}{9} \log_e\left(\frac{8}{9}\right)$

D. $\frac{\pi}{8}\log_e\left(\frac{3}{2}\right)$

Answer: B

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14. The length of the diameter of the circle which passes through the point (2,3) and touches the x-axis at the point (1,0) is

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

B. $\frac{6}{5}$

C. $\frac{10}{3}$

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

Answer: C

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15. If $P = \frac{\sin 300^\circ . \tan 330^\circ . \sec 420^\circ}{\tan 135^\circ . \sin 210^\circ . \sec 315^\circ}$ $Q = \frac{\sec 480^\circ . \cos ec570^\circ . \tan 330^\circ}{\sin 600^\circ . \cos 660^\circ . \cot 405^\circ}$ then P and Q are respectively.

A. 2,16

B. $\sqrt{S}(2), \frac{16}{3}$

C. $-2, \frac{3}{16}$

D. None of these

Answer: B

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16. For $x \in [0, a)$

$4x + 8\cos x - 4\log[\cos x(1 + \sin x)]$ then

$+\tan x - 2\sec x \geq 6$ largest value of a is

equal to

A. $\pi/3$

B. $\pi/4$

C. $3\pi/4$

D. $\pi/6$

Answer: D

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17. The value of

$\tan^{-1}\left[\frac{\sqrt{1+x^2}+\sqrt{1-x^2}}{\sqrt{1+x^2}-\sqrt{1-x^2}}\right], |x| < \frac{1}{2}$ x is

$\neq 0$ equal to

A. $\frac{\pi}{4}+\frac{1}{2}\cos^{-1}x^2$

B. $\frac{\pi}{4}-\cos^{-1}x^2$

C. $\frac{\pi}{4}-\frac{1}{2}\cos^{-1}x^2$

D. $\frac{\pi}{4}+\cos^{-1}x^2$

Answer: A

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18. The locus of the point (h,k) for which the circle having centre at origin and radius equals to 2 touches the line $hx + ky = 1$ is

A. Circle

B. Parabola

C. Ellipse

D. Hyperbola

Answer: A

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19. The number of real roots of he equation

$$1 + a_1 x + a_2 x^2 + \ldots\ldots\ldots\ldots + a_n x^n = 0$$

where $|x| < \frac{1}{3}$ and $|a_n| < 2$ is

A. n if n is even

B. 0 for any natural number n

C. 1 if n is odd

D. None of these

Answer: B

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20. For al $n \in N$ and $n \geq 3, 2^{4n} - 2^{n}(7n+1)$

is not divisible by

A. 196

B. 98

C. 49

D. 48

Answer: D

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21. If the 4 th term in expansion of $\left(\sqrt{\frac{1}{\frac{1}{x^{\log_{10} x+1}}}}+x^{\frac{1}{12}}\right)^{6}$ is $200, \forall x > 1,$ then find the value of x

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22. Let the words formed by the letters of word OPTS be arranged in dictionary order. The ranks of words SPOT, POTS, STOP and POST are p,q,r,s respectively then evaluate $q-s+r-p$

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23. Matrix M_r is defined as

$M_r = \begin{bmatrix} r & r-1 \\ r-1 & r \end{bmatrix}, r \in N.$ If $\sum_{r=1}^{2007} \det(M_r) = (2000+\lambda)^2$, then find the value of λ

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24. If the sum of the first n terms of the series

$\sqrt{5} + \sqrt{125} + \sqrt{405} + \sqrt{845} + \ldots.$ is $276\sqrt{5}$

then find the value of n.

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25. Two points A and B in argand plane represent z and $z_1 = 2(z + \sqrt{3} + i)$ respectively. If A moves on a circle with centre at origin and radius $\sqrt{3}$ and $\max.(arg z_1) - \min.(arg z_1) = m\pi$ find $\frac{1}{m}$

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26. If

$$\int \frac{6x+3}{\sqrt{3-6x-9x^2}}dx = -\frac{2}{3}f(x)+g(x)+c$$

Then the domain of the function $f+g$ is $[a, b]$

then $\left|\frac{a}{b}\right| =$

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27. Let $f(x) = \left[\frac{x^2}{64}+2\right]$. Find the area in sq. units bounded by line $y = x - 1$, curve $y = f(x)$, lines $x = 0, y = 0$ ([ ] represents the greatest integer function.)

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28. For the following observations 2,3,5,6,8,10,2,17,20,25. Find the mean deviation about median.

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29. Consider the differential equation

$$\frac{x+\frac{x^2}{3!}+\frac{x^5}{5!}+\ldots\ldots\ldots}{1+\frac{x^2}{2!}+\frac{x^4}{4!}+\ldots\ldots\ldots}=\frac{dx-dy}{dx+dy}.$$

If $y(0)=1$ and the solution of the differential equation is of the form

$2yf(x) = me^{2x} + n$. Evaluate $(m+n)f(0)$.

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