

## MATHS

### BOOKS - NTA MOCK TESTS

### NTA JEE MOCK TEST 29

#### Mathematics

1. Vectors  $3\vec{a} - 5\vec{b}$  and  $2\vec{a} + \vec{b}$  are mutually perpendicular. If  $\vec{a} + 4\vec{b}$  and  $\vec{b} - \vec{a}$  are also mutually perpendicular, then the cosine of the angle between  $\vec{a}$  and  $\vec{b}$  is

A.  $\cos^{-1}\left(\frac{19}{5\sqrt{43}}\right)$

B.  $\pi - \cos^{-1}\left(\frac{19}{5\sqrt{43}}\right)$

C.  $\cos^{-1}\left(\frac{9}{5\sqrt{43}}\right)$

D.  $\pi - \cos^{-1}\left(\frac{9}{5\sqrt{43}}\right)$

**Answer: A**



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2. If  $a_1, a_2, a_3$  are in arithmetic progression and  $d$  is the common difference, then

$$\tan^{-1}\left(\frac{d}{1+a_1a_2}\right) + \tan^{-1}\left(\frac{d}{1+a_2a_3}\right) =$$

A.  $\tan^{-1}\left(\frac{2d}{1 + a_1a_3}\right)$

B.  $\tan^{-1}\left(\frac{d}{1 + a_1a_3}\right)$

C.  $\tan^{-1}\left(\frac{2d}{1 + a_2a_3}\right)$

D.  $\tan^{-1}\left(\frac{2}{1 - a_1a_3}\right)$

**Answer: A**



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**3.** The solution of the differential equation

$$\frac{dy}{dx} + \frac{y}{x} = \frac{1}{(1 + \ln x + \ln y)^2}$$
 is (where,  $c$  is an

arbitrary constant)

$$\text{A. } xy \left[ 1 + \left( \ln(xy)^2 \right) \right] = \frac{x^2}{2} + c$$

$$\text{B. } 1 + (\ln(xy))^2 = \frac{x^2}{2} + y + c$$

$$\text{C. } xy(1 + \ln(xy)) = \frac{x^2}{2} + c$$

$$\text{D. } xy(1 + \ln(xy)) = \frac{x}{2} + c$$

**Answer: A**



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4. If  $p$  : "4 is an odd number" and  $q$  : " $4^3$  is an even number" are two statements, then which of the following statements is equivalent to  $\sim(p \Rightarrow q)$ ?

A. '4 is an odd number and  $4^3$  is an even number"

B. The negation of the statement "4 is not an odd number of  $4^3$  is not an even number"

C. Both ("4 is an odd number and  $4^3$  is an even number") and (The negation of the statement "4 is not an odd number of  $4^3$  is not an even number")

D. '4 is an odd number and  $4^3$  is not an even number"

**Answer: D**



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5. Tangents are drawn to the circle  $x^2 + y^2 = 16$  at the points where it intersects the circle  $x^2 + y^2 - 6x - 8y - 8 = 0$ , then the point of intersection of these tangents is

A.  $\left(4, \frac{16}{3}\right)$

B.  $(12, 16)$

C.  $(3, 4)$

D.  $(16, 12)$

**Answer: B**



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6. A closed cylindrical can has to be made with  $100m^2$  of plastic. If its volume is maximum, then the ratio of its radius to the height is

A. 1 : 1

B. 1 : 2

C. 2 : 1

D.  $\sqrt{2} : 1$

**Answer: B**



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7. If  $A$  and  $B$  are non-singular square matrix of same order  $3 \times 3$ , then which of the following options is correct?

A.  $|adj(AB)| = |A||B|$

B.  $|(adj AB)^{-1}| = |adj(AB)|$

C.  $|adj(AB)^{-1}| = |adj(AB)^{-1}|$

D.  $|adj(AB)^T| = |AB|^{-2}$



**Answer: C**



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**8.** The area (in sq. units) enclosed by the graphs of

$$|x + y| = 2 \text{ and } |x| = 1 \text{ is}$$

A. 2

B. 4

C. 6

D. 8

**Answer: D**



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9. The sum to  $n$  terms of

$$\left[ \frac{1}{1.3} + \frac{2}{13.5} + \frac{3}{1.3.5.7} + \frac{4}{1.3.5.7.9} + \dots \dots \dots \right]$$

A.  $\frac{1}{2} \left[ 1 + \frac{1}{1.3.5. \dots \dots (2n + 1)} \right]$

B.  $\frac{1}{2} \left[ 1 - \frac{1}{2.4.6. \dots \dots .2n} \right]$

C.  $\frac{1}{2} \left[ 1 - \frac{1}{1.3.5. \dots \dots \dots (2n + 1)} \right]$

D. None of these

Answer: C



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10. The value of P for which both the roots of the equation  $4x^2 - 20Px + (25P^2 + 15P - 66) = 0$  are less than 2, lies in

A.  $\left(\frac{4}{5}, 2\right)$

B.  $(0, 2)$

C.  $\left(-1, -\frac{4}{5}\right)$

D.  $(-\infty, -1)$

**Answer: D**



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11. Let  $g(x) = |x - 2|$  and  $h(x) = g(g(x))$  be two functions, then the value of  $h'(-1) + h'(1) + h'(3) + h'(5)$  is equal to (where,  $h'$  denotes the derivative of  $h$ )

A. 2

B. -1

C. 0

D. 1

**Answer: C**



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12. A card is lost from a pack of 52 playing cards. From remainder of the pack of a card is drawn and is found to be a spade. The probability that the missing card is spade, is

A.  $\frac{5}{17}$

B.  $\frac{4}{17}$

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

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

**Answer: B**



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13. Suppose S and S' are foci of the ellipse  $\frac{x^2}{25} + \frac{y^2}{16} = 1$ . If P is a variable point on the ellipse and if  $\Delta$  is the area (in sq. units) of the triangle PSS' then the maximum value of  $\Delta$  is double of

A. Minimum value of  $\frac{2a^8 + 2b^4}{a^4b^2} \forall a, b \in R$

B. Minimum value of  $\frac{3a^8 + 3b^4}{a^4b^2} \forall a, b \in R$

C.  $\frac{4a^8 + 4b^4}{a^4b^2} \forall a, b \in R$

D.  $\frac{6a^8 + 6b^4}{a^4b^2} \forall a, b \in R$

**Answer: B**



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14. If  $\cot(\alpha + \beta) = 0$ , then  $\sin(\alpha + 2\beta)$  is equal to

A.  $\sin \alpha$

B.  $\cos \alpha$

C.  $\sin \beta$

D.  $\cos 2\beta$

**Answer: A**



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15. The value of

$$\Delta = \begin{vmatrix} 1 & \sin 3\theta & \sin^3 \theta \\ 2 \cos \theta & \sin 6\theta & \sin^3 2\theta \\ 4 \cos^2 \theta - 1 & \sin 9\theta & \sin^3 3\theta \end{vmatrix} \text{ equal to}$$

A.  $-2$

B.  $-1$

C.  $1$

D.  $0$

**Answer: D**



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16.  $\lim_{x \rightarrow 0} \frac{(1 - \cos 2x)(3 + \cos x)}{x \tan 4x}$  is equal to

A. 1

B. 2

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

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

**Answer: B**



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17. The number of 7 digit integers  $abcdefg$ , where  $a < b < c < d > e > f > g$  such that  $a, b, c, d, e, f, g$  in  $\{1,2,3,\dots,9\}$ . Are

A. 700

B. 20

C. 720

D. 800

**Answer: C**



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18. If  $\int_{\frac{-1}{\sqrt{3}}}^{1/\sqrt{3}} \frac{x^4}{1-x^4} \cos^{-1} \left( \frac{2x}{1+x^2} \right) dx = k,$   
then  $\int_0^{1/\sqrt{3}} \frac{x^4}{1-x^4} dx$

the value of k is equal to

- A.  $\pi$
- B.  $2\pi$
- C.  $-\pi$
- D.  $3\pi$

**Answer: A**



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19. If  $(9a, 6a)$  is a point bounded in the region formed by parabola  $y^2 = 16x$  and  $x = 9$ , then

A.  $a \in (0, 1)$

B.  $a < \frac{1}{4}$

C.  $a < 1$

D.  $0 < a < 4$

**Answer: A**



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20.

Let

$$P_1: x - 2y + 3z = 5 \text{ and } P_2: 2x - 3y + z + 4 = 0$$

be two planes. The equation of the plane perpendicular to the line of intersection to the line of intersection of  $P_1 = 0$  and  $P_2 = 0$  and passing through  $(1, 1, 1)$  is

A.  $11x - 5y + 7z - 13 = 0$

B.  $7x + 5y + z = 13$

C.  $x + 2y + z - 4 = 0$

D.  $x - 2y + 4z + 3 = 0$

**Answer: B**



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21. If the 6th term in the expansion of

$$\left[ \frac{1}{x^{\frac{8}{3}}} + x^2 \log_{10} x \right]^8 \text{ is } 5600, \text{ then } x =$$



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22. If  $f(x)$  is the antiderivative of

$$\left( 1 + 2 \tan x (\tan x + \sec x)^{\frac{1}{2}} \right) \text{ and } f\left(\frac{\pi}{6}\right) = \log 2$$

, then the value of  $f(0)$  is



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23. Let  $f(x) = \sin\left(\frac{x}{3}\right) + \cos\left(\frac{3x}{10}\right)$  for all real  $x$ .

Find the least natural number  $n$  such that  $f(n\pi + x) = f(x)$  for all real  $x$ .



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24. If  $x + \frac{1}{x} = 1$  and  $p = x^{4000} + \frac{1}{x^{4000}}$  and  $q$  is

the digit at

unit place in the number  $2^{2^n} + 1$ ,  $n \in \mathbb{N}$  and  $n > 1$

, then  $p + q$  is .



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25. If variance of first  $n$  natural number is 10 and variance of first  $m$  even natural number is 16 then the value of  $m+n$  is



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