

Ques No.

Question

1

JEE ADVANCED MATHS SOLUTIONS - 2009 || Paper 1

Let $z = x + iy$ be a complex number where x and y are integers. Then, the area of the rectangle whose vertices are the roots of the equation $zz^3 + z\bar{z}^3 = 350$ is 48 (b) 32 (c) 40 (d) 80

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Let $z = \cos \theta + i \sin \theta$. Then, the value of $\sum_{m=1}^{15} \text{Im}(z^{2m-1})$ at $\theta = 2^\circ$ is $\frac{1}{\sin 2^\circ}$
(b) $\frac{1}{3\sin 2^\circ}$ (c) $\frac{1}{2\sin 2^\circ}$ (d) $\frac{1}{4\sin 2^\circ}$

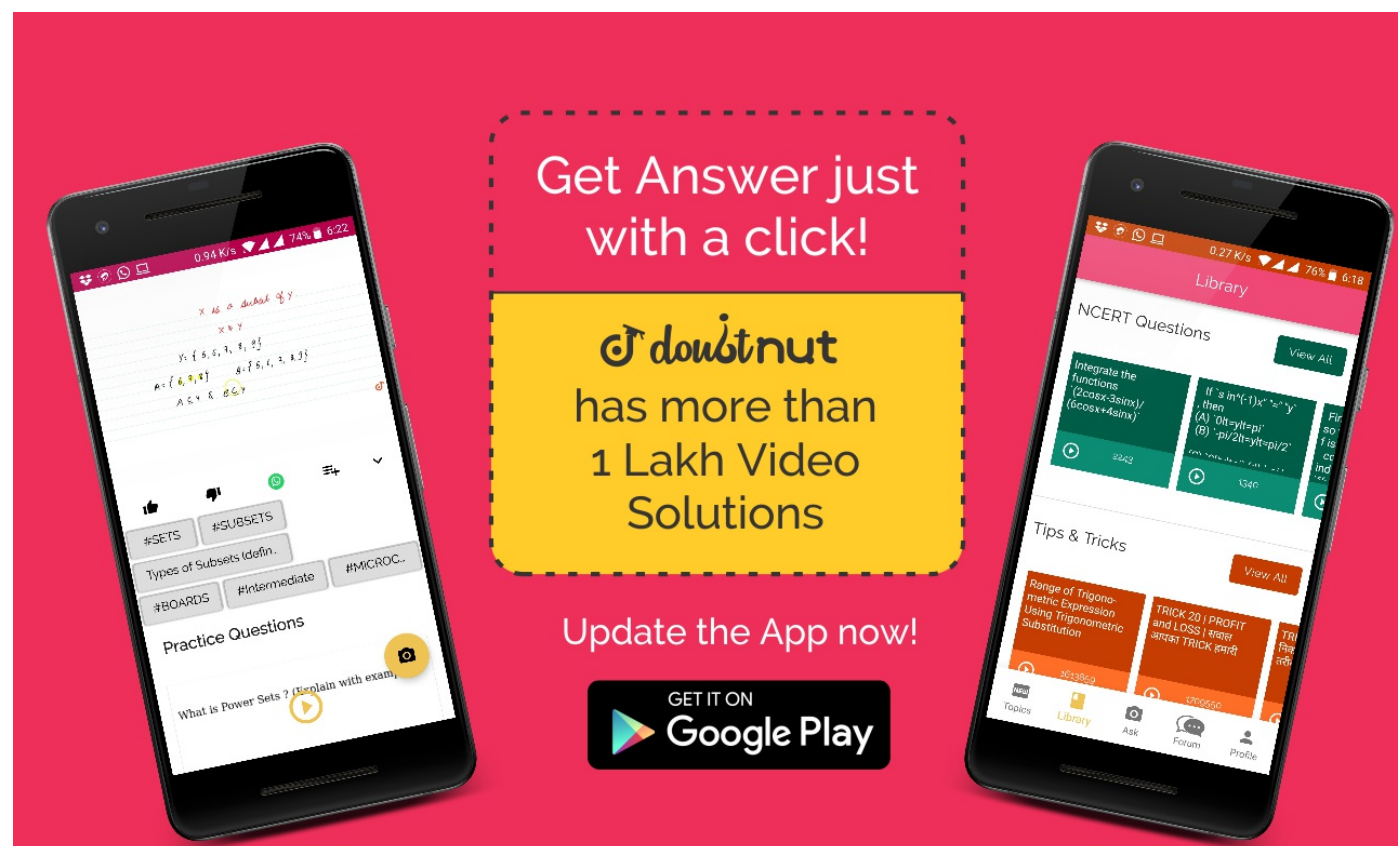
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The number of seven digit integers, with sum of the digits equal to 10 and formed by using the digits 1, 2 and 3 only, is


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Let f be a non-negative function defined on the interval $[0, 1]$. If

$$\int_0^x \sqrt{1 - (f'(t))^2} \cdot dt$$

$= \int_0^x f(t) \cdot dt, 0 \leq x \leq 1$ and $f(0)=0$, then

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Tangents drawn from the point $P(1, 8)$ to the circle

$$x^2 + y^2 - 6x - 4y - 11 = 0$$

touch the circle at the points A and B . The equation of the circumcircle of the triangle PAB is

(A)

$$x^2 + y^2 + 4x - 6y + 19 = 0$$

(B)

$$x^2 + y^2 - 4x - 10y + 19 = 0$$

(C)

$$x^2 + y^2 - 2x + 6y - 29 = 0$$

(D)

$$x^2 + y^2 - 6x - 4y + 19 = 0$$

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a triangle ABC with fixed base BC , the vertex A moves such that

$$\cos B + \cos C = 4 \frac{\sin^2 A}{2}$$

If a, b and c , denote the length of the sides of the triangle opposite to the angles A, B , and C , respectively, then $b + c = 4a$ (b) $b + c = 2a$ the locus of point A is an ellipse the locus of point A is a pair of straight lines

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If

$$\frac{\sin^4 x}{2} + \frac{\cos^4 x}{3} = \frac{1}{5}$$

then

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$$\tan^2 x = \frac{2}{3} \text{ (b)}$$

$$\frac{\sin^8 x}{8} + \frac{\cos^8 x}{27}$$

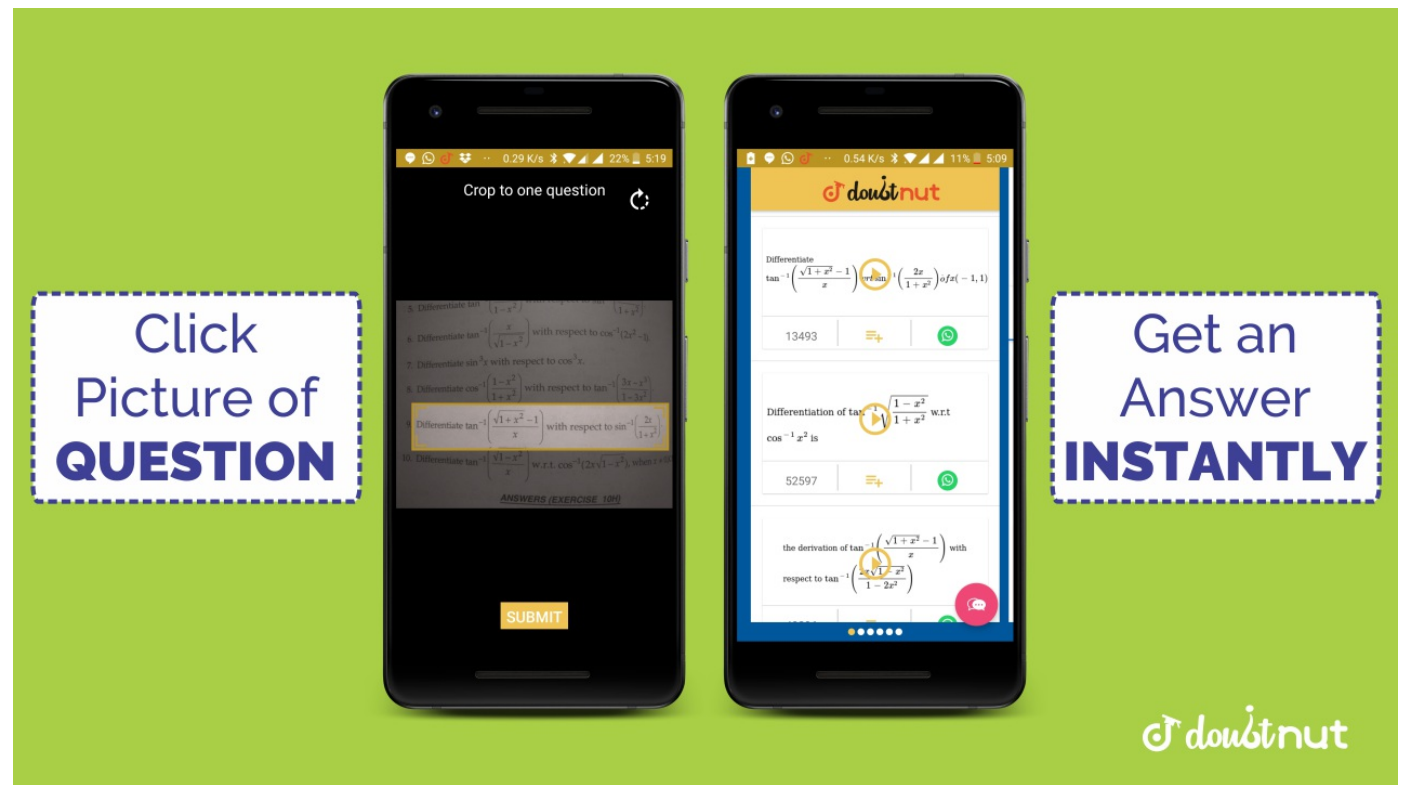
$$= \frac{1}{125}$$

$$\tan^2 x = \frac{1}{3} \text{ (d)}$$

$$\frac{\sin^8 x}{8} + \frac{\cos^8 x}{27}$$

$$= \frac{2}{125}$$

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Let
 L

$$= \lim_{x \rightarrow 0} \frac{a - \sqrt{a^2 - x^2} - \frac{x^2}{4}}{x^4},$$

$a > 0$. If $L \in \mathbb{R}$, then

$$a = 2 \text{ (b) } a = 1 \text{ (c) } L = \frac{1}{64} \text{ (d) } L = \frac{1}{32}$$

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The area of the region bounded by the curve $y = e^x$ and lines $x = 0$ and $y = e$ is $e - 1$ (b) $\int_1^e \ln(e + 1 - y) dy$ (c) $e - \int_0^1 e^x dx$ (d) $\int_1^e \ln y dy$

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A fair die is tossed repeatedly until a six is obtained. Let X denote the number of tosses required. The probability that $X = 3$ equals

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Let A be the set of all 3×3 skew-symmetric matrices whose entries are either $-1, 0,$ or 1 . If there are exactly three 0 s, three 1 s, and three (-1) 's, then the number of such matrices is _____.

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The normal at a point P on the ellipse $x^2 + 4y^2 = 16$ meets the x -axis at Q . If M is the midpoint of the line segment PQ , then the locus of M intersects the latus

rectums of the given ellipse at points. $\left(\pm \frac{(3\sqrt{5})}{2}, \pm \frac{2}{7} \right)$ (b)

$$\left(\pm \frac{(3\sqrt{5})}{2}, \pm \frac{\sqrt{19}}{7} \right)$$

$$\left(\pm 2\sqrt{3}, \pm \frac{1}{7} \right) \text{ (d) } \left(\pm 2\sqrt{3} \pm \frac{4\sqrt{3}}{7} \right)$$

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The locus of the orthocentre of the triangle formed by the lines

$$\begin{aligned} (1+p)x - py \\ + p(1+p) &= 0, \\ (1+q)x - qy \\ + q(1+q) &= 0 \end{aligned}$$

and $y = 0$, where $p \neq q$, is (A) a hyperbola (B) a parabola (C) an ellipse (D) a straight line

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The line passing through the extremity A of the major axis and extremity B of the minor axis of the ellipse $x^2 + 9y^2 = 9$ meets its auxiliary circle at the point M . Then the area of the triangle with vertices at A , M , and O (the origin) is $\frac{31}{10}$ (b) $\frac{29}{10}$ (c) $\frac{21}{10}$ (d) $\frac{27}{10}$

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A line with positive direction cosines passes through the point $P(2, -1, 2)$ and makes equal angles with the coordinate axes. The line meets the plane $2x + y + z = 9$ at point Q . The length of the line segment PQ equals

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If the sum of first n terms of an AP is cn^2 , then the sum of squares of these n terms is (2009) $\frac{n(4n^2 - 1)c^2}{6}$ (b) $\frac{n(4n^2 + 1)c^2}{3}$ $\frac{n(4n^2 - 1)c^2}{3}$ (d) $\frac{n(4n^2 + 1)c^2}{6}$

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The tangent PT and the normal PN to the parabola $y^2 = 4ax$ at a point P on it meet its axis at points T and N , respectively. The locus of the centroid of the triangle PTN is a parabola whose:

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For the function

$$f(x) = x \cos x \frac{1}{x}, x$$

≥ 1

(A) for at least one x in the interval $[1, c)$, $f(x+2)-f(x) > 2$ (B) $\lim_{x \rightarrow c} f(x) = 1$ (C) for all x in the interval $[1, c)$, $f(x+2)-f(x) > 2$ (D) $f(x)$ is strictly decreasing in the interval $[1, c)$ $\lim_{x \rightarrow c} f(x) =$

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For $\lim_{x \rightarrow 0}$

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20	<p>JEE ADVANCED MATHS SOLUTIONS - 2009 Paper 2</p> <p>7. An ellipse intersects the hyperbola $2x^2 - 2y^2 = 1$ orthogonally. The eccentricity of the ellipse is reciprocal to that of the (2009) hyperbola. If the axes of the ellipse are along the coordinate axes, then (b) the foci of ellipse are $(+1, 0)$ (a) equation of ellipse is $x^2 + 2y^2 = 2$ (d) the foci of ellipse are $(\pm 2, 0)$ (c) equation of ellipse is $x^2 - 2y^2 = 2$</p> <p>▶ Watch Free Video Solution on Doubtnut</p>
21	<p>JEE ADVANCED MATHS SOLUTIONS - 2009 Paper 2</p> <p>Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be a continuous function which satisfies $f(x) = \int_0^x f(t) dt$. Then the value of $f(1)$ is _____</p> <p>▶ Watch Free Video Solution on Doubtnut</p>
22	<p>JEE ADVANCED MATHS SOLUTIONS - 2009 Paper 2</p> <p>The centres of two circles C_1 and C_2 each of unit radius are at a distance of 6 units from each other. Let P be the mid point of the line segment joining the centres of C_1 and C_2 and C be a circle touching circles C_1 and C_2 externally. If a common tangent to C_1 and C passing through P is also a common tangent to C_2 and C, then the radius of the circle C is</p> <p>▶ Watch Free Video Solution on Doubtnut</p>
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The smallest value of k , for which both the roots of the equation, $x^2 - 8kx + 16(k^2 - k + 1) = 0$ are real, distinct and have values at least 4, is

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The maximum value of the function $f(x) = 2x^3 - 15x^2 + 36x - 48$

on the set $A = \{x | x^2 | 20 \leq 9x\}$ is _____.

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Let ABC and ABC' be two non-congruent triangles with sides $AB = 4, AC = AC' = 2\sqrt{2}$ and angle $B = 30^\circ$. The absolute value of the difference between the areas of these triangles is

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If the function $f(x) = x^3 + e^{\frac{x}{2}}$ and $g(x) = f^{-1}(x)$

, then the value of $g'(1)$ is

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