

Ques No.

Question

1

**JEE ADVANCED MATHS SOLUTIONS - 2010 || Paper 1**

Let  $p$  and  $q$  be real numbers such that

$$p \neq 0, p^3 \neq q, \text{ and } p^3 \neq -q.$$

If  $\alpha$  and  $\beta$  are nonzero complex numbers satisfying

$$\alpha + \beta = -p \text{ and } \alpha^2$$

$$+ \beta^2 = q$$

, then a quadratic equation having  $\alpha / \beta$  and  $\beta / \alpha$  as its roots is

$$(p^3 + q)x^2$$

$$- (p^3 + 2q)x$$

$$+ (p^3 + q) = 0$$

$$(p^3 + q)x^2$$

$$- (p^3 - 2q)x$$

$$+ (p^3 + q) = 0$$

$$(p^3 + q)x^2$$

$$- (5p^3 - 2q)x$$

$$+ (p^3 - q) = 0$$

$$(p^3 + q)x^2$$

$$- (5p^3 + 2q)x$$

$$+ (p^3 + q) = 0$$

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**JEE ADVANCED MATHS SOLUTIONS - 2010 || Paper 1**

Let  $f, g$  and  $h$  be real-valued functions defined on the interval  $[0, 1]$  by  $f(x) = e^{x^2} + e^{-x^2}$ ,  $g(x) = xe^{x^2} + e^{-x^2}$  and  $h(x) = x^2e^{x^2} + e^{-x^2}$ . If  $a, b$  and  $c$  denote respectively, the absolute maximum of  $f, g$  and  $h$  on  $[0, 1]$  then

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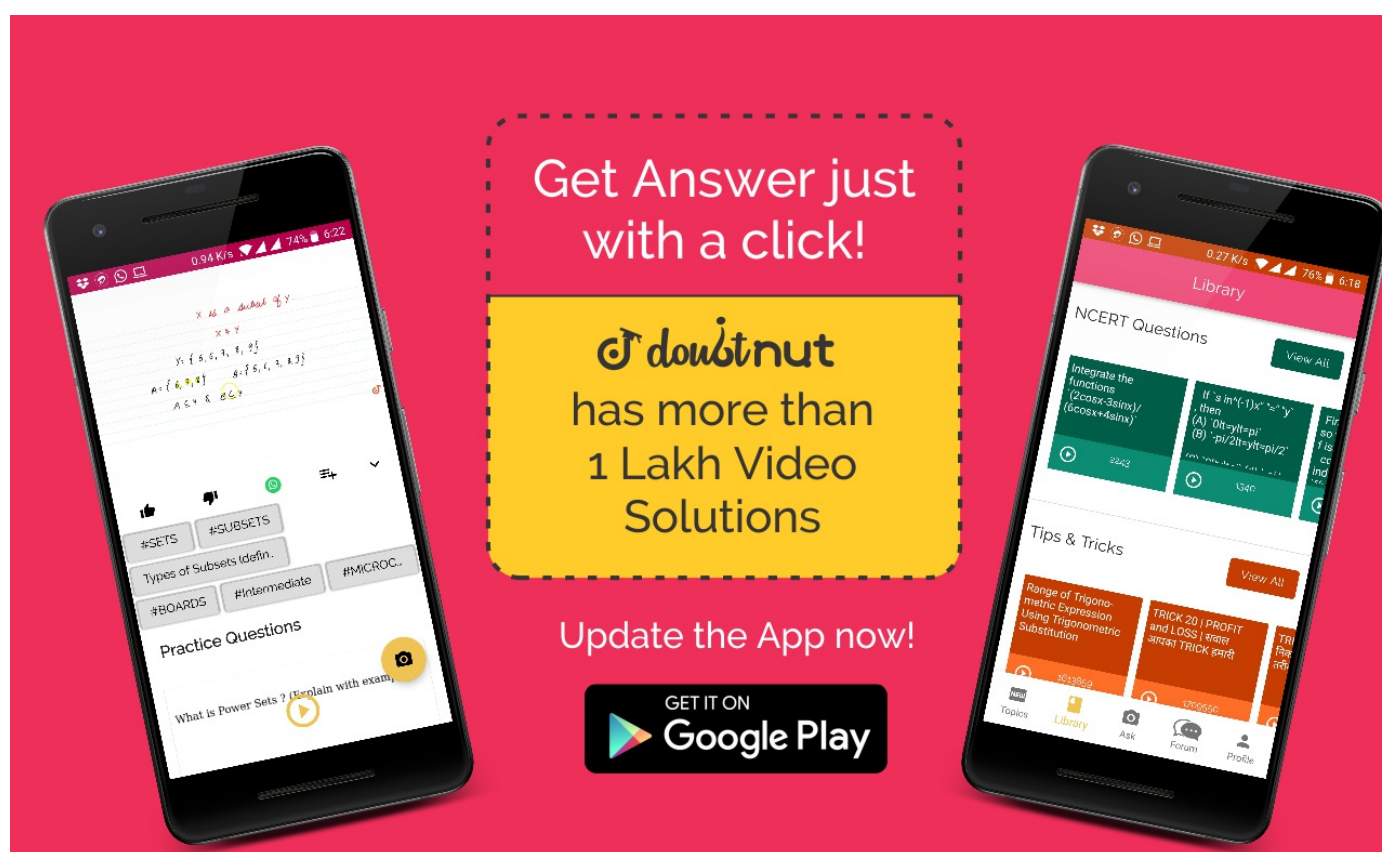
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**JEE ADVANCED MATHS SOLUTIONS - 2010 || Paper 1**

If the angle  $A, B$  and  $C$  of a triangle are in an arithmetic progression and if  $a, b$  and  $c$  denote the lengths of the sides opposite to  $A, B$  and  $C$  respectively, then the value of

the expression  $\frac{a}{c} \sin 2C + \frac{c}{a} \sin 2A$  is  $\frac{1}{2}$  (b)  $\frac{\sqrt{3}}{2}$  (c) 1 (d)  $\sqrt{3}$

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Equation of the plane containing the straight line  $\frac{x}{2} = \frac{y}{3} = \frac{z}{4}$  and perpendicular to the plane containing the straight lines  $\frac{x}{2} = \frac{y}{4} = \frac{z}{2}$  and  $\frac{x}{4} = \frac{y}{2} = \frac{z}{3}$  is

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Let  $\omega$  be a complex cube root unity with  $\omega \neq 1$ . A fair die is thrown three times. If  $r_1, r_2$  and  $r_3$  are the numbers obtained on the die, then the probability that  $\omega^{r_1} + \omega^{r_2} + \omega^{r_3} = 0$  is 1/18 b. 1/9 c. 2/9 d. 1/36

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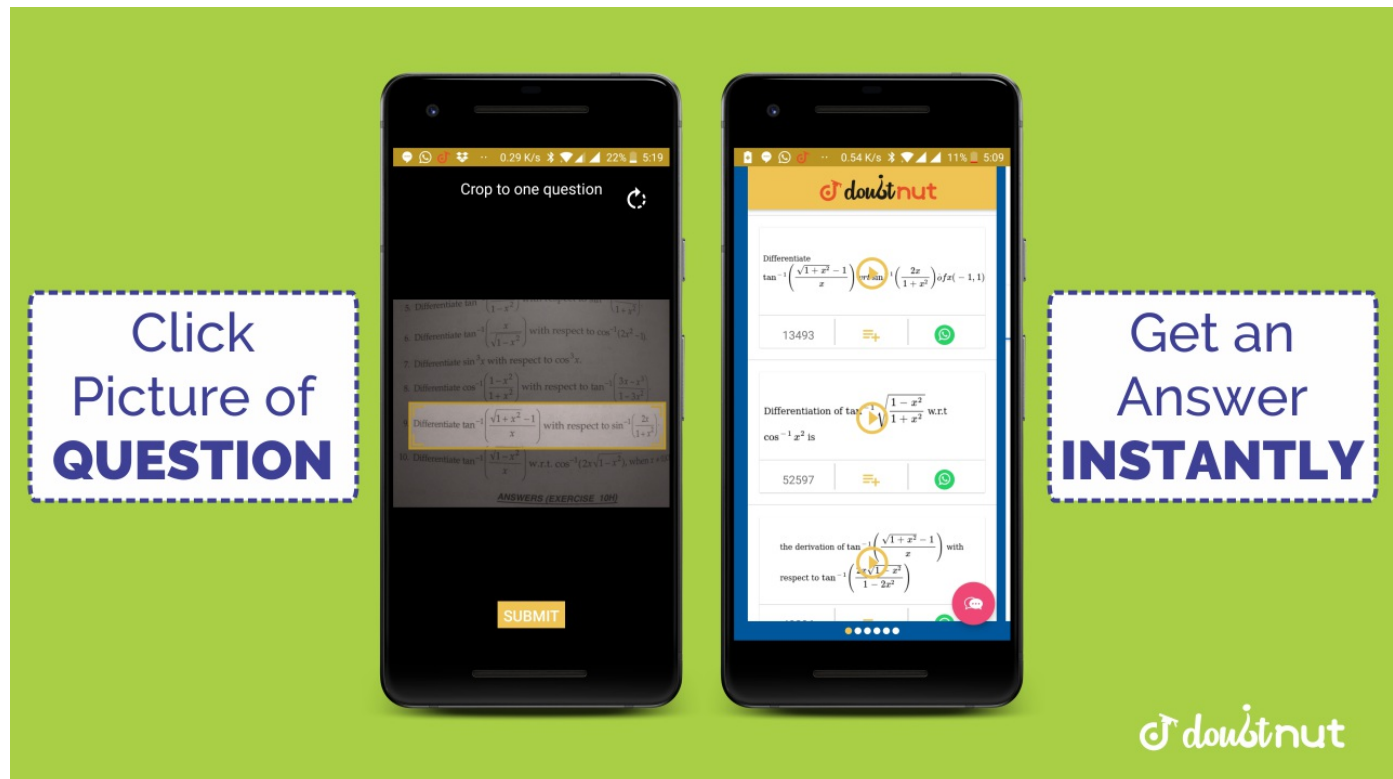
Let  $P, Q, R$  and  $S$  be the points on the plane with position vectors  $-2i - j, 4i, 3i + 3j$  and  $-3j + 2j$ , respectively. The quadrilateral  $PQRS$  must be a Parallelogram, which is neither a rhombus nor a rectangle Square Rectangle, but not a square Rhombus, but not a square

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**JEE ADVANCED MATHS SOLUTIONS - 2010 || Paper 1**

The number of  $3 \times 3$  matrices  $A$  whose entries are either 0 or 1 and for which the

7

system  $A[xyz] = [100]$  has exactly two distinct solution is a. 0 b.  $2^9 - 1$  c. 168 d. 2[👉 Watch Free Video Solution on Doubtnut](#)

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The value of  $\int_0^1 \frac{x^4(1-x)^4}{1+x^2} dx$  is/are (a)  $\frac{22}{7} - \pi$  (b)  $\frac{2}{105}$  (c) 0 (d)  $\frac{71}{15} - \frac{3\pi}{2}$

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Let  $f$  be a real-valued function defined on interval  $(0, \infty)$ , by

$$f(x) = \ln x +$$

$$\int_0^x \sqrt{1 + \sin t} \cdot dt$$

. Then which of the following statement(s) is (are) true? A.  $f''(x)$  exists for all  $x \in (0, \infty)$ . B.  $f'(x)$  exists for all  $x \in (0, \infty)$  and  $f'$  is continuous on  $(0, \infty)$ , but not differentiable on  $(0, \infty)$ . C. there exists  $\alpha > 1$  such that  $|f'(x)| < |f(x)|$  for all  $x \in (\alpha, \infty)$ . D. there exists  $\beta > 1$  such that  $|f(x)| + |f'(x)| \leq \beta$  for all  $x \in (0, \infty)$ .

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Let A and B be two distinct points on the parabola  $y^2 = 4x$ . If the axis of the parabola touches a circle of radius r having AB as its diameter, then the slope of the line joining A and B can be

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Let ABC be a triangle such that  $\angle ACB = \frac{\pi}{6}$  and let a, b and c denote the lengths of the sides opposite to A, B and C respectively. The value(s) of x for which

$$a = x^2 + x + 1, b = x^2 - 1$$

and  $c = 2x + 1$

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Let p be an odd prime number and  $T_p$ , be the following set of  $2 \times 2$  matrices

$$T_p = \left\{ A = \begin{bmatrix} a & b \\ c & a \end{bmatrix} : a, b, c \in \{0, 1, 2, \dots, p-1\} \right\}$$

The number of A in  $T_p$ , such that A is either symmetric or skew-symmetric or both, and  $\det(A)$  divisible by p is

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The circle  $x^2 + y^2 - 8x = 0$  and hyperbola  $\frac{x^2}{9} - \frac{y^2}{4} = 1$  intersect at the points A and B. Equation of a common tangent with positive slope to the circle as well as to the hyperbola is

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**JEE ADVANCED MATHS SOLUTIONS - 2010 || Paper 1**

The circle  $x^2 + y^2 - 8x = 0$  and hyperbola  $\frac{x^2}{9} - \frac{y^2}{4} = 1$  intersect at points A and B. Then Equation of the circle with A B as its diameter is

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Let  $f$  be a real-valued differentiable function on  $\mathbb{R}$  (the set of all real numbers) such that  $f(1) = 1$ . If the  $y$ -intercept of the tangent at any point  $P(x, y)$  on the curve  $y = f(x)$  is equal to the cube of the abscissa of  $P$ , then the value of  $f(-3)$  is equal to \_\_\_\_\_

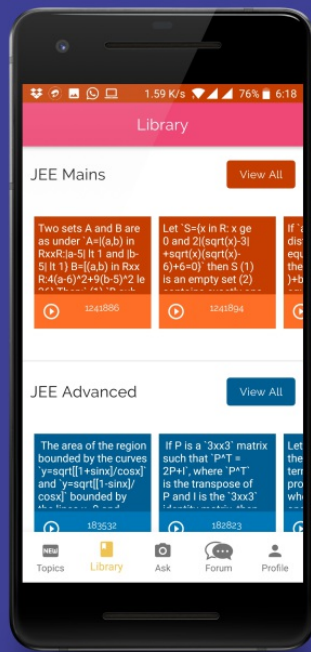
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The number of values of  $\theta$  in the interval  $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$  such that  $\theta \neq n\frac{\pi}{5}$  for  $n \in \mathbb{N}$  and  $\tan \theta = \cot 5\theta$  as well as  $\sin 2\theta = \cos 4\theta$  is

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The maximum value of the expression  $\frac{1}{\sin^2 \theta + 3 \sin \theta \cos \theta + 5 \cos^2 \theta}$  is

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If  $\vec{a}$  and  $\vec{b}$  are vectors in space given by

$$\vec{a} = \frac{\hat{i} - 2\hat{j}}{\sqrt{5}} \text{ and } \vec{b} = \frac{2\hat{i} + \hat{j} + 3\hat{k}}{\sqrt{14}}$$

, then find the value of

$$\left( 2\vec{a} + \vec{b} \right) \left( \vec{a} \times \vec{b} \right) \times \left( \vec{a} - 2\vec{b} \right)$$

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The line  $2x + y = 1$  is tangent to the hyperbola  $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ . If this line passes through the point of intersection of the nearest directrix and the x-axis, then the eccentricity of the hyperbola is

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If the distance between the plane  $Ax - 2y + z = d$ . and the plane containing the

$$\frac{x + 1}{2} = \frac{y - 2}{3}$$

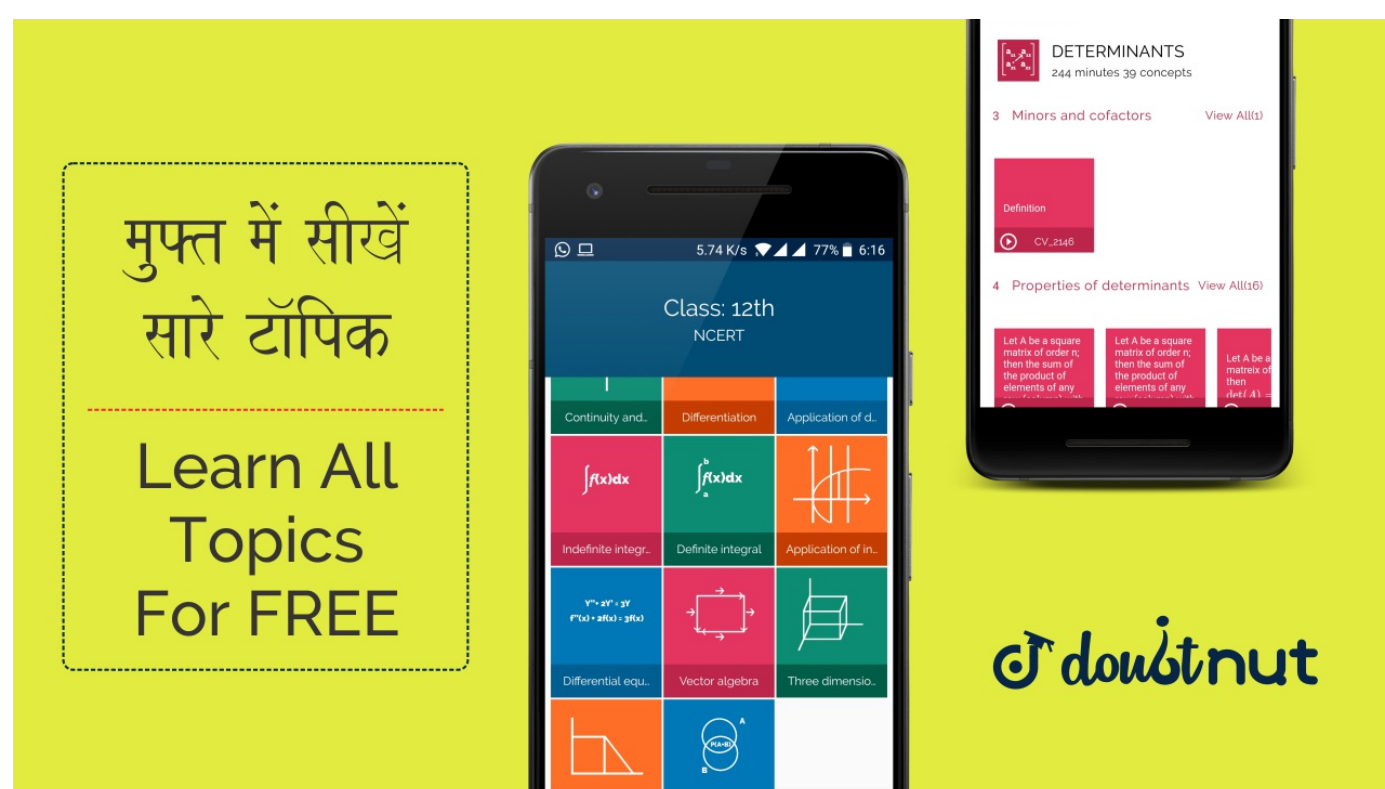
$$= \frac{z - 3}{4} \text{ and}$$

$$\frac{x - 2}{3} = \frac{4 - 3}{4}$$

$$= \frac{z - 4}{5}$$

is  $\sqrt{6}$ , then  $|d|$  is

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For any real number  $x$ , let  $[x]$  denote the largest integer less than or equal to  $x$ , Let  $f$  be a real-valued function defined on the interval  $[-10, 10]$  be

$$f(x) = \{x - [x],$$

$$\text{if } [x] \text{ is odd } 1 + [x]$$

$$- x, \text{ if } [x] \text{ is even}$$

Then the value of

$$\frac{\pi^2}{10} \int_{-1}^{10} f(x) \cos \pi x dx \text{ is } \_ \_$$

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Let  $\omega$  be the complex number



25

$$\cos\left(\frac{2\pi}{3}\right)$$

$$+ i \sin\left(\frac{2\pi}{3}\right)$$

. Then the number of distinct complex cos numbers  $z$  satisfying  $\Delta$

$$= \begin{vmatrix} z+1 & \omega & \omega^2 \\ \omega & z+\omega^2 & 1 \\ \omega^2 & 1 & z+\omega \end{vmatrix}$$

$$= 0$$

is

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Let  $S_k, k = 1, 2, \dots, 100$ , denotes the sum of the infinite geometric series whose first term is  $\frac{k-1}{k!}$  and the common ratio is  $\frac{1}{k}$ , then the value of

$$\frac{100^2}{100!} +$$

$$\sum_{k=1}^{100} (k^2 - 3k + 1)S_k$$

is \_\_\_\_\_.

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### JEE ADVANCED MATHS SOLUTIONS - 2010 || Paper 2

Let  $f$  be a real-valued function defined on the interval  $(-1, 1)$  such that  $e^{-x}f(x) = 2 +$

$$\int_0^x \sqrt{t^4 + 1} dt,$$

for all,  $x \in (-1,$

$1)$  and let  $f^{-1}$

be the inverse function of  $f$ . Then  $(f^{-1})'(2)$  is equal to 1 (b)  $\frac{1}{3}$  (c)  $\frac{1}{2}$  (d)  $\frac{1}{e}$

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**JEE ADVANCED MATHS SOLUTIONS - 2010 || Paper 2**

If  $P(A) = 0.4, P(B) = 0.48$  and  $P(A \cap B) = 0.16$ , then find the value of each of the following:

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There are  $n$  AM's between 1 & 31 such that  $7^{th} mean : (n - 1)^{th} mean = 5 : 9$ , then find the value of  $n$ .

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A signal which can be green or red with probability  $\frac{4}{5}$  and  $\frac{1}{5}$  respectively, is received by station A and then and 3 transmitted to station B. The probability of each station receiving the signal correctly is  $\frac{3}{4}$ . If the signal received at station B is green, then the probability that the original signal was green is

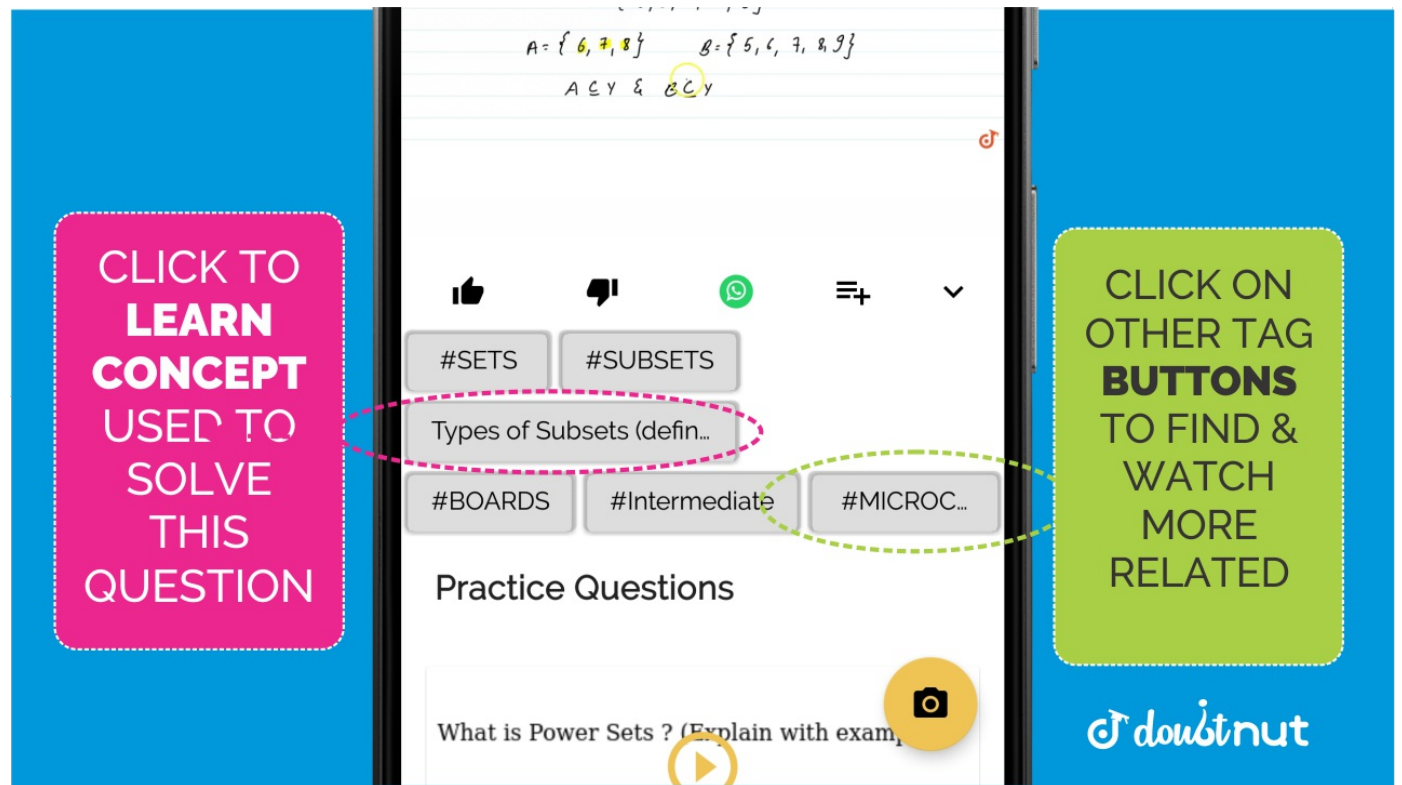
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Let  $S = \{1, 2, 3, 4\}$ . The total number of unordered pairs of disjoint subsets of  $S$  is equal a. 25 b. 34 c. 42 d. 41

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For  $r = 0, 1, \dots, 10$ , let  $A_r, B_r$ , and  $C_r$  denote, respectively, the coefficient of  $x^r$  in the expansions of

$$(1 + x)^{10},$$

$$(1 + x)^{20} \text{ and } (1 + x)^{30}$$

.Then

$$\sum_{r=1}^{10} A_r (B_{10} B_r - C_{10} A_r)$$

is equal to

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Two adjacent sides of a parallelogram  $ABCD$  are given by

$$\vec{AB} = 2\hat{i} + 10\hat{j} + 11\hat{k} \text{ and } \vec{AD} = -\hat{i} + 2\hat{j} + 2\hat{k}.$$

The side  $AD$  is rotated by an acute angle  $\alpha$  in the plane of the parallelogram so that  $AD$  becomes  $AD'$ . If  $AD'$  makes a right angle with the side  $AB$ , then the cosine

of the angle  $\alpha$  is given by  $\frac{8}{9}$  b.  $\frac{\sqrt{17}}{9}$  c.  $\frac{1}{9}$  d.  $\frac{4\sqrt{5}}{9}$

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Let  $K$  be a positive real number and

34

$$\begin{aligned}
 &A \\
 &= [2k \\
 &- 12\sqrt{k}2\sqrt{k}2\sqrt{k}1 \\
 &- 2k - 2\sqrt{k}2k \\
 &- 1] \text{ and } B \\
 &= [02k - 1\sqrt{k}1 \\
 &- 2k02 - \sqrt{k} \\
 &- 2\sqrt{k}0]
 \end{aligned}$$

. If  $\det(\text{adj}A) + \det(\text{adj}B) = 10^6$ , then  $[k]$

is equal to. [Note:  $\text{adj}M$  denotes the adjoint of a square matrix  $M$  and  $[k]$  denotes the largest integer less than or equal to  $K$ ].

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Let  $f$  be a function defined on  $R$  (the set of all real numbers) such that  $f'(x) = 2010(x$

- 2009)(x
- 2010)<sup>2</sup>(x
- 2011)<sup>3</sup>(x
- 2012)<sup>4</sup>,

for all  $x \in R$ . If  $g$  is a function defined on  $R$  with values in the interval  $(0, \infty)$  such that  $f(x) = \ln(g(x))$ , for all  $x \in R$ , then the number of point is  $R$  at which  $g$  has a local maximum is \_\_\_\_

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Let  $a_1, a_2, a_3, \dots, a_{11}$  be real numbers satisfying

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$$a_1 = 15, 27 - 2a_2$$

$$> 0 \text{ and } a_k$$

$$= 2a_{k-1} - a_{k-2}$$

for  $k = 3, 4, \dots, 11$  If

$$\frac{a_1^2 + a_2^2 + \dots + a_{11}^2}{11}$$

$$= 90$$

then find the value of  $\frac{a_1 + a_2 + \dots + a_{11}}{11}$ 

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Consider a triangle  $ABC$  and let  $a, b$  and  $c$  denote the lengths of the sides opposite to vertices  $A, B$ , and  $C$ , respectively. Suppose  $a = 6, b = 10$ , and the area of triangle is  $15\sqrt{3}$ . If  $\angle ACB$  is obtuse and if  $r$  denotes the radius of the incircle of the triangle, then the value of  $r^2$  is

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Two parallel chords of a circle of radius 2 are at a distance  $\sqrt{3+1}$  apart. If the chord subtend angles  $\frac{\pi}{k}$  and  $\frac{2\pi}{k}$  at the center, where  $k > 0$ , then the value of  $[k]$  is

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Consider the polynomial  $f$

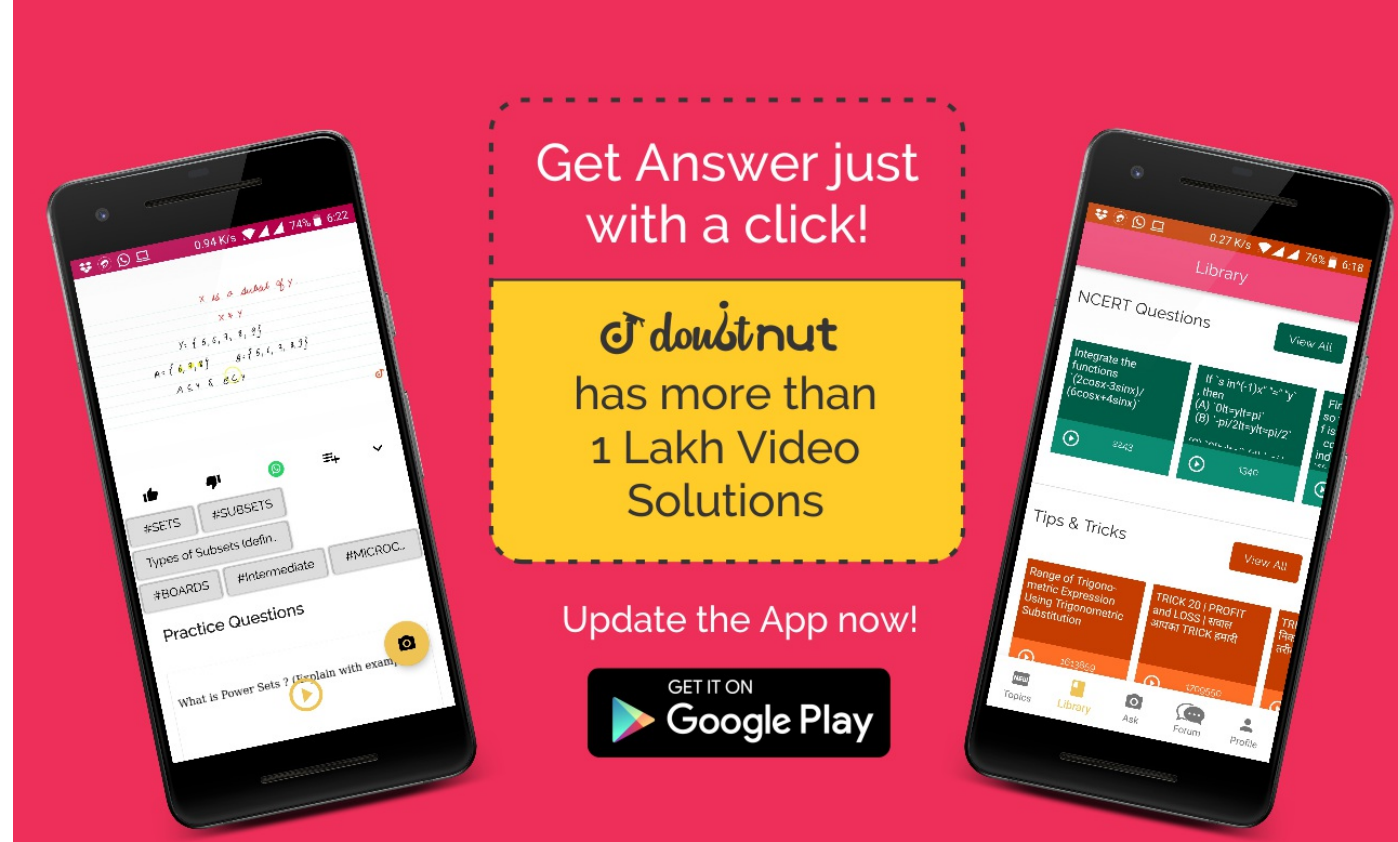
$$f(x) = 1 + 2x + 3x^2$$

$$+ 4x^3$$

. Let  $s$  be the sum of all distinct real roots of  $f(x)$  and let  $t = |s|$ .

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Consider the polynomial  $f$

$$f(x) = 1 + 2x + 3x^2$$

$$+ 4x^3$$

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Consider the polynomial  $f$

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$$+ 4x^3$$

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The set of points  $z$

$$|z - i|z| = |z + i|z|$$

||

is contained in or equal to

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