

Ques No.

Question

1

**JEE ADVANCED MATHS SOLUTIONS - 2013 || Paper 1**

Perpendiculars are drawn from points on the line

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

to the plane  $x + y + z = 3$  The feet of perpendiculars lie on the line

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For  $a > b > c > 0$ , the distance between  $(1,1)$  and point of intersection of the lines  $ax + by + c = 0$  and  $bx + ay + c = 0$  is less than  $2\sqrt{2}$ , Then

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The area enclosed by the curves

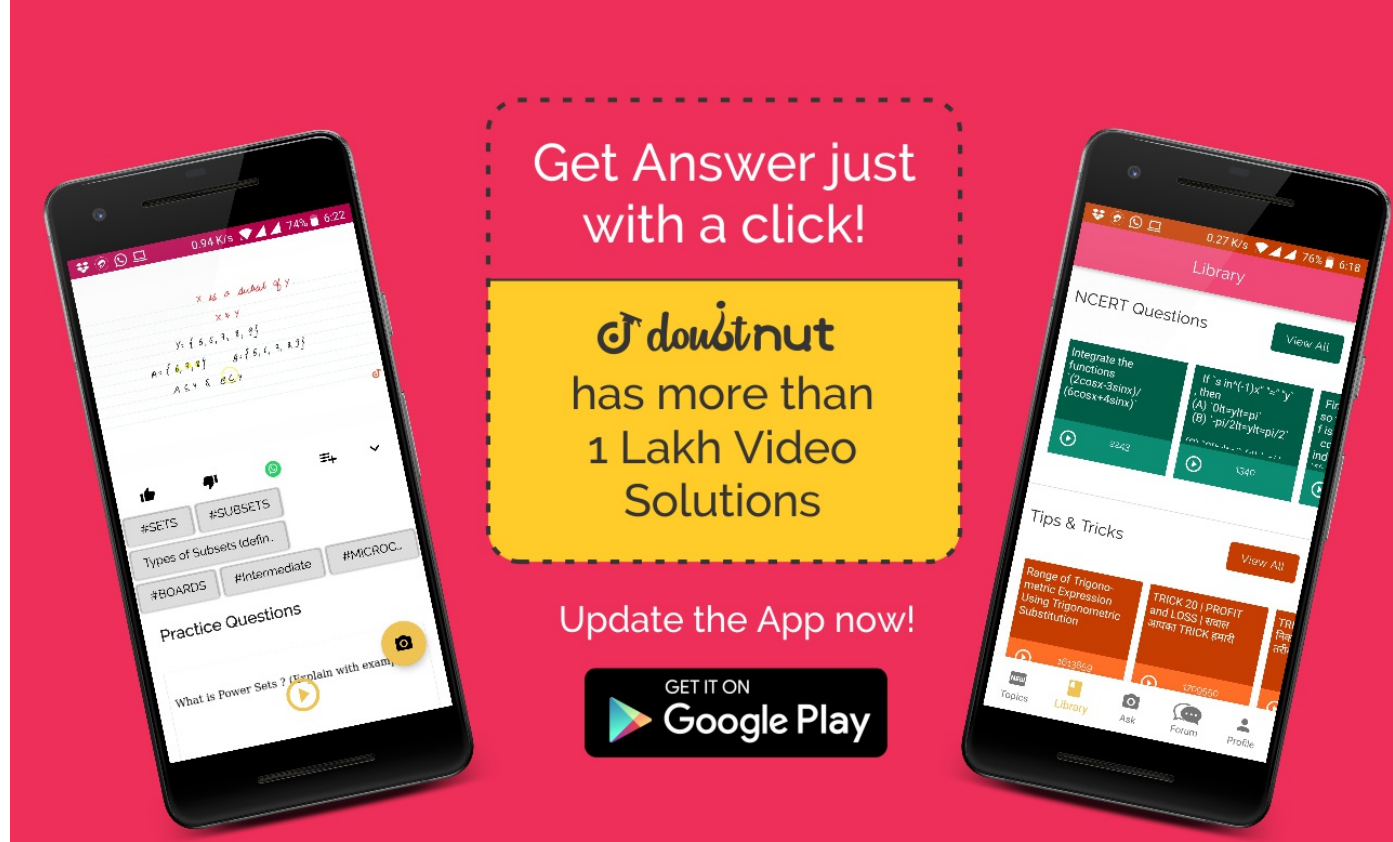
$$y = \sin x$$

$$+ \cos x \text{ and } y =$$

$$= |\cos x - \sin x|$$

over the interval  $\left[0, \frac{\pi}{2}\right]$

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Four person independently solve a certain problem correctly with probabilities  $\frac{1}{2}, \frac{3}{4}, \frac{1}{4}, \frac{1}{8}$ . Then the probability that he problem is solve correctly by at least one of them is  $\frac{235}{256}$  b.  $\frac{21}{256}$  c.  $\frac{3}{256}$  d.  $\frac{253}{256}$

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The total number of ways in which 5 balls of differert colours can be distributed among 3 persons so thai each person gets at least one ball is

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Let complex numbers  $\alpha$  and  $\frac{1}{\alpha}$  lies on circles

$$(x - x_0)^2 + (y - y_0)^2 = r^2$$

and

$$(x - x_0)^2 + (y - y_0)^2 = 4r^2$$

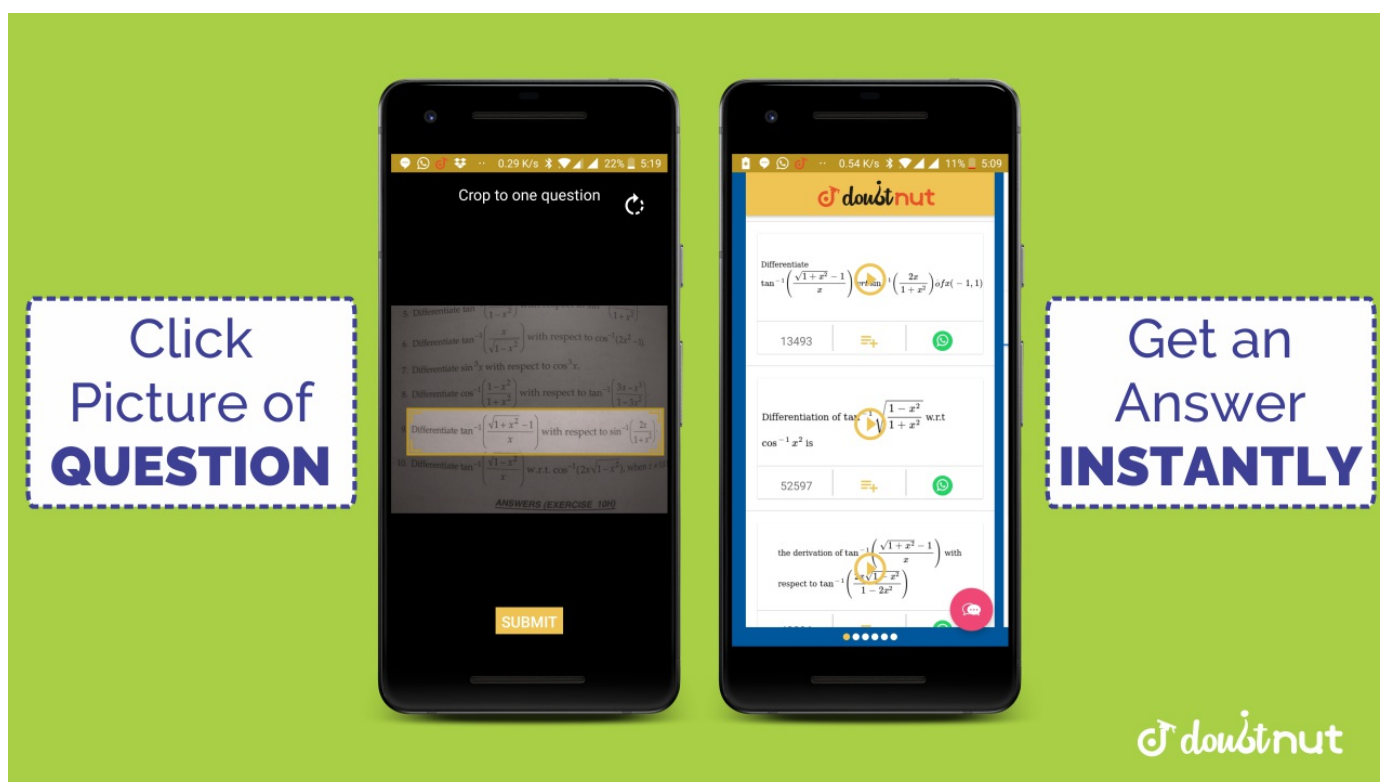
respectively. If  $z_0 = x_0 + iy_0$  satisfies the equation  $2|z_0|^2 = r^2 + 2$  then  $|\alpha|$  is equal to

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The number of points in  $(-\infty, \infty)$ , for which  $x^2 - x \sin x - \cos x = 0$ , is 6 (b) 4 (c) 2 (d) 0



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Let  $f: \left[\frac{1}{2}, 1\right] \rightarrow R$  (the set of all real numbers) be a positive, non-constant, and differentiable function such that

$$f'(x) < 2f(x) \text{ and } f\left(\frac{1}{2}\right) = 1$$

. Then the value of  $\int_{\frac{1}{2}}^1 f(x)dx$  lies in the interval (a)  $(2e - 1, 2e)$  (b)  $(3 - 1, 2e - 1)$  (c)  $\left(\frac{e - 1}{2}, e - 1\right)$  (d)  $\left(0, \frac{e - 1}{2}\right)$

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Let  $\vec{P}R = 3\hat{i} + \hat{j} - 2\hat{k}$  and  $\vec{S}Q = \hat{i} - 3\hat{j} - 4\hat{k}$

determine diagonals of a parallelogram

$PQRS$ , and  $\vec{P}T = \hat{i} + 2\hat{j} + 3\hat{k}$

be another vector. Then the volume of the parallelepiped determine by the vectors  $\vec{P}T, \vec{P}Q$  and  $\vec{P}S$  is 5 b. 20 c. 10 d. 30

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A curve passes through the point  $\left(1, \frac{\pi}{6}\right)$ . Let the slope of the curve at each point  $(x, y)$  be  $\frac{y}{x} + \sec\left(\frac{y}{x}\right), x > 0$ . Then the equation of the curve is

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Let  $f(x) = x \sin \pi x, x > 0$ . Then for all natural numbers  $n$ ,  $f'(x)$  vanishes at

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Let  $S_n = \sum_{k=1}^{4n} (-1)^k \frac{k(k+1)}{2} k^2$ . Then  $S_n$  can take value (s) 1056 b. 1088 c. 1120 d. 1332

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For  $3 \times 3$  matrices  $M$  and  $N$ , which of the following statement (s) is (are) NOT correct?  $N^T M N$  is symmetric or skew-symmetric, according as  $m$  is symmetric or skew-symmetric.  $MN - NM$  is skew-symmetric for all symmetric matrices  $M$  and  $N$ .  $MN$  is symmetric for all symmetric matrices  $M$  and  $N$ .

$(adjM)(adjN)$   
 $= adj(MN)$   
 for all invertible matrices  $M$  and  $N$ .

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A rectangular sheet of fixed perimeter with sides having their lengths in the ratio 8 : 15 is converted into an open rectangular box by folding after removing squares of equal area from all four corners. If the total area of removed squares is 100, the resulting box has maximum volume. Then the length of the sides of the rectangular sheet are 24 (b) 32 (c) 45 (d) 60

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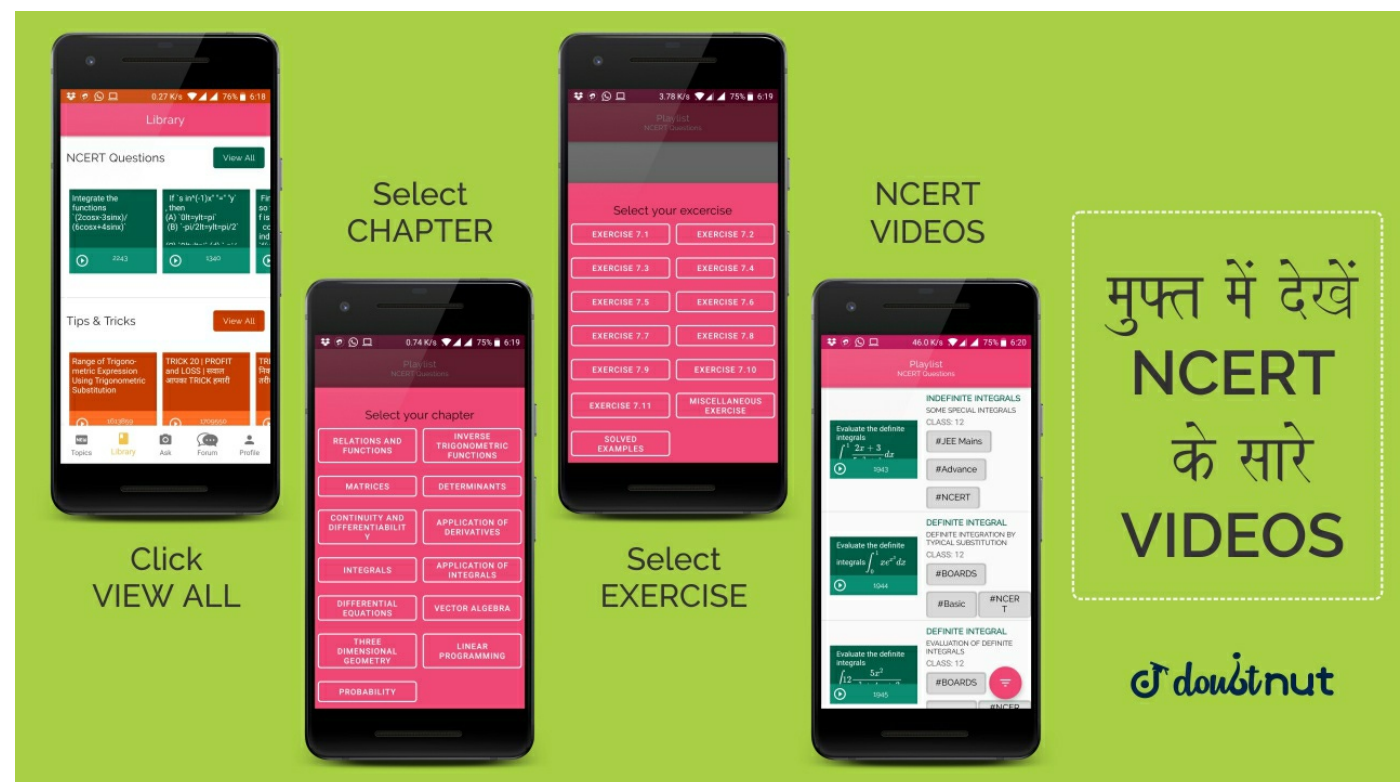
Consider the set of eight vector

$$V = \{a\hat{i} + b\hat{j} + c\hat{k};$$

$$a, bc \in \{-1, 1\}\}.$$

Three non-coplanar vectors can be chosen from  $V$  is  $2^p$  ways. Then  $p$  is \_\_\_\_\_.

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The coefficients of three consecutive terms of  $(1 + x)^{n+5}$  are in the ratio 5:10:14. Then  $n =$  \_\_\_\_\_.

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A pack contains  $n$  cards numbered from 1 to  $n$ . Two consecutive numbered cards are removed from the pack and the sum of the numbers on the remaining cards is

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1224. If the smaller of the numbers on the removed cards is  $k$ , then  $k - 20 =$  \_\_\_\_\_.

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For  $a > b > c > 0$ , the distance between  $(1, 1)$  and point of intersection of the lines  $ax + by + c = 0$  and  $bx + ay + c = 0$  is less than  $2\sqrt{2}$ , Then

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A vertical line passing through the point  $(h, 0)$  intersects the ellipse  $\frac{x^2}{4} + \frac{y^2}{3} = 1$  at the points  $P$  and  $Q$ . Let the tangents to the ellipse at  $P$  and  $Q$  meet at  $R$ . If  $\delta(h)$  Area of triangle  $\delta PQR$ , and  $\delta_1 \max_{\frac{1}{2} \leq h \leq 1} \delta(h)$  A further  $\delta_2 \min_{\frac{1}{2} \leq h \leq 1} \delta(h)$  Then

$$\frac{8}{\sqrt{5}}\delta_1 - 8\delta_2$$

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Two sets A and B are as under:  $A = \{(a, b) \in \mathbb{R} \times \mathbb{R} : |a - b| \leq 1\}$  and  $B = \{(a, b) \in \mathbb{R} \times \mathbb{R} : 4(a - 6)^2 + 9(b - 5)^2 \leq 2\}$

Let  $S = \{x \in \mathbb{R} : x \geq 0\}$  and  $T = \{x \in \mathbb{R} : x \leq 3\}$ . If  $S \cap T$  is an empty set (2)

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The area of the region bounded by the curves  $y = \sqrt{1 + \sin x}$  and  $y = \sqrt{1 - \sin x}$  bounded by  $x = 0$  and  $x = \pi$

If  $P$  is a  $3 \times 3$  matrix such that  $P^T = 2P + I$ , where  $P^T$  is the transpose of  $P$  and  $I$  is the  $3 \times 3$  identity matrix, then the value of  $\det(P)$  is

Let the term  $a_n$  in the expansion of  $(x + \frac{1}{x})^{20}$  be independent of  $x$ . Then the value of  $n$  is

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For  $a \in R$  (the set of all real numbers),  $a \neq -1$ ,  
 $(\lim)_{n \rightarrow \infty}$

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$$\left( \frac{1^a + 2^a + \dots + n^a}{(n+1)^{a-1}[(na+1) + (na+2) + \dots + (na+n)]} \right)_{n \rightarrow \infty} = \frac{1}{60}$$

Then  $a =$  (a) 5 (b) 7 (c)  $\frac{-15}{2}$  (d)  $\frac{-17}{2}$

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Circle(s) touching x-axis at a distance 3 from the origin and having an intercept of length  $2\sqrt{7}$  on y-axis is (are)

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In a triangle PQR, P is the largest angle and  $\cos P = \frac{1}{3}$ . Further the incircle of the triangle touches the sides PQ, QR and RP at N, L and M respectively, such that the lengths of PN, QL and RM are consecutive even integers. Then possible length(s) of the side(s) of the triangle is (are)

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Let  $w = (\sqrt{3} + i)\frac{1}{2}$  and

$$P = \{w^n : n = 1, 2,$$

$$3, \dots\},$$

Further

$$H_1 = \left\{ z \in C \right.$$

$$\left. : \operatorname{Re}(z) > \frac{1}{2} \right\} \text{ and}$$

$$H_2 = \left\{ z \in c \right.$$

$$\left. : \operatorname{Re}(z) < -\frac{1}{2} \right\}$$

Where C is set of all complex numbers. If

$$z_1 \in P \cap H_1, z_2 \in P$$

$$\cap H_2$$

and O represent the origin, then  $\angle Z_1 O Z_2 =$

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Let  $\omega$  be a complex cube root of unity with  $\omega \neq 1$  and  $P = [p_{ij}]$  be a  $n \times n$  matrix with  $p_{ij} = \omega^{i+j}$ . Then  $p^2 \neq O$ , where  $n =$  a. 57 b. 55 c. 58 d. 56

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The function

$$f(x) = 2|x|$$

$$+ |x + 2| = ||x|2|$$

$$- 2|x||$$

has a local minimum or a local maximum at  $x = -2$  (b)  $-\frac{2}{3}$  (c) 2 (d)  $\frac{2}{3}$



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**JEE ADVANCED MATHS SOLUTIONS - 2013 || Paper 2**

Let  $f[0, 1] \rightarrow R$  (the set of all real numbers) be a function. Suppose the function  $f$  is twice differentiable,  $f(0) = f(1) = 0$ , and satisfies

$$f''(x) - 2f'(x) + f(x) \leq e^x, x$$

$$x \in [0, 1]$$

.Which of the following is true for  $0 < x < 1$ ?

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Let PQ be a focal chord of the parabola  $y^2 = 4ax$ . The tangents to the parabola at P and Q meet at a point lying on the line  $y = 2x + a$ ,  $a > 0$ . Length of chord PQ is

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A box  $B_1$ , contains 1 white ball, 3 red balls and 2 black balls. Another box  $B_2$ , contains 2 white balls, 3 red balls and 4 black balls. A third box  $B_3$ , contains 3 white balls, 4 red balls and 5 black balls.

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A box  $B_1$ , contains 1 white ball, 3 red balls and 2 black balls. Another box  $B_2$ , contains 2 white balls, 3 red balls and 4 black balls. A third box  $B_3$ , contains 3 white balls, 4 red balls and 5 black balls.

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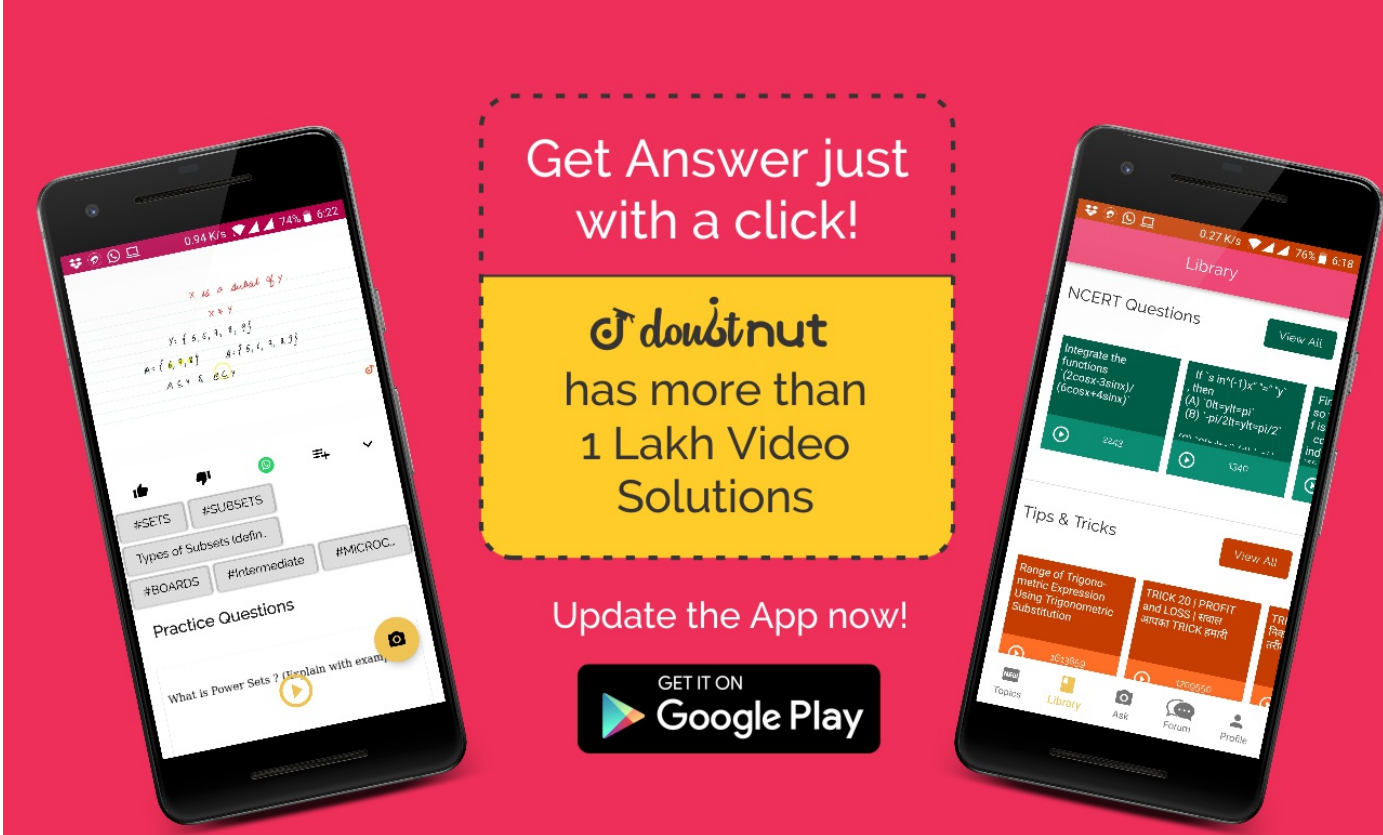
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