



# MATHS

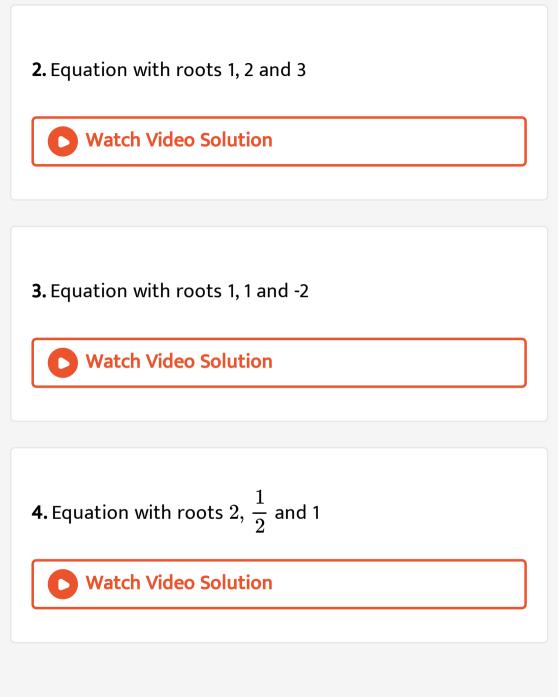
# **BOOKS - SURA MATHS (TAMIL ENGLISH)**

# **THEORY OF EQUATIONS**

## Exercise 31

**1.** If the sides of a cunbic box are increased by 1, 2, 3 units respectively to form a cuboid, then the volume is increased by 52 cubic units. Find the volume of the cuboid.





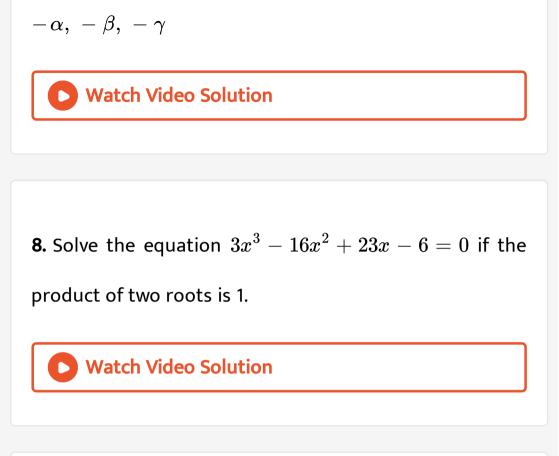
5. If lpha,eta and  $\gamma$  are the roots of the cubic equation  $x^3+2x^2+3x+4=0,$  for a cubic equation roots are  $2lpha,2eta,2\gamma$ 

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6. If  $\alpha$ ,  $\beta$  and  $\gamma$  are the roots of the cubic equation  $x^3 + 2x^2 + 3x + 4 = 0$ , for a cubic equation roots are  $\frac{1}{\alpha}, \frac{1}{\beta}, \frac{1}{\gamma}$ 

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7. If lpha,eta and  $\gamma$  are the roots of the cubic equation  $x^3+2x^2+3x+4=0,$  for a cubic equation roots are



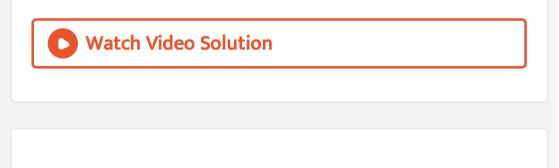
9. Find the sum of squares of roots of the equation

$$2x^4 - 8x^3 + 6x^2 - 3 = 0$$

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10. Solve the equation  $x^3 - 9x^2 + 14x + 24 = 0$  if it is

given that two of its roots are in the rotio 3:2.



11. If  $\alpha, \beta$  and  $\gamma$  are the roots of the polynomial equation

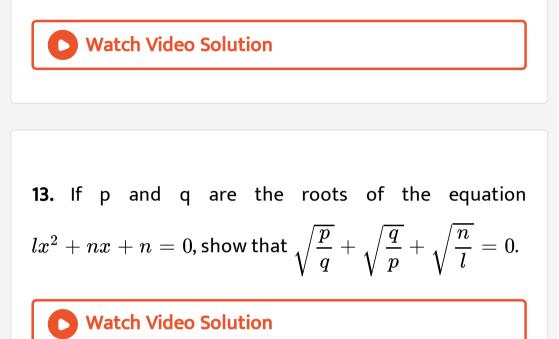
 $ax^3+bx^2+cx+d=0,$  find the value of  $\Sigmarac{a}{eta\gamma}$  in

terms of the coefficients.

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12. If  $lpha,eta,\gamma$  and  $\delta$  are the roots of the polynomial eqauation  $2x^4+5x^3-7x^2-8=0$ , find a quadratic

equation with integer corddicients whose roots are  $\alpha + \beta + \gamma + \delta$  and  $\alpha \beta \gamma \delta$ .



14. If the equation  $x^2 + px + q = 0$  and  $x^2 + p'x + q' = 0$  have common roots, show that it must be equal to  $\frac{pq' - p'q}{q - q'}$  or  $\frac{q - q'}{p' - p}$ . Watch Video Solution **15.** Formulate into a mathematical problem to find a number such that when its cube root is added to it, the result is 6.



**16.** A 12 metre tell tree was broken into Two it was found that the height of the part which was left standing was the cube root of the length of the part that was cut away. Formulate this into a mathematical problem to find the height of the part which was cut away.



1. If k is real, discuss the neture of the roots of the polynomial equaion  $2x^2 + x + k = 0$ , in terms of k.

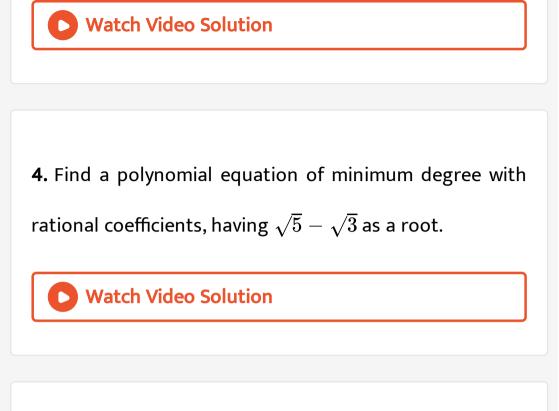
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**2.** Find a polynomial equation of minimum degree with rational coefficients, having  $2 + \sqrt{3}$ I as a root.



**3.** Find a polynomial equation of minimum degree with

rational coefficients, having 2i+3 as a root.



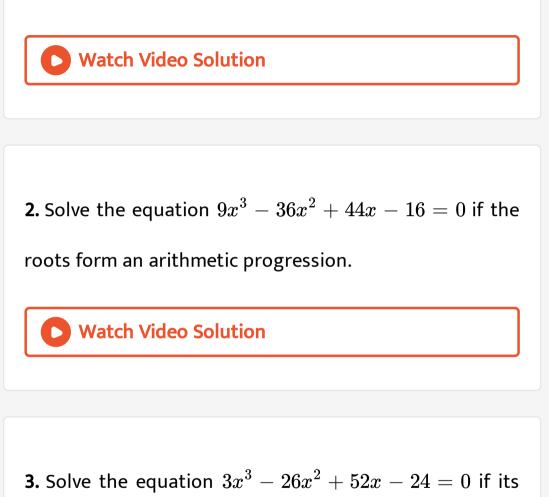
**5.** Provet that a stralght line and parabola connot intersect at more than two points.



# Exercise 3 3

1. Solve the cubic equation  $: 2x^3 - x^2 - 18x + 9 = 0$  if

sum of two of its roots vanishes.



roots form a geometric progression.

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4. Determine k and solve the equation  $2x^3 - 6x^2 + 3x + k = 0$  if one of its roots is twice the sum of the other two roots.

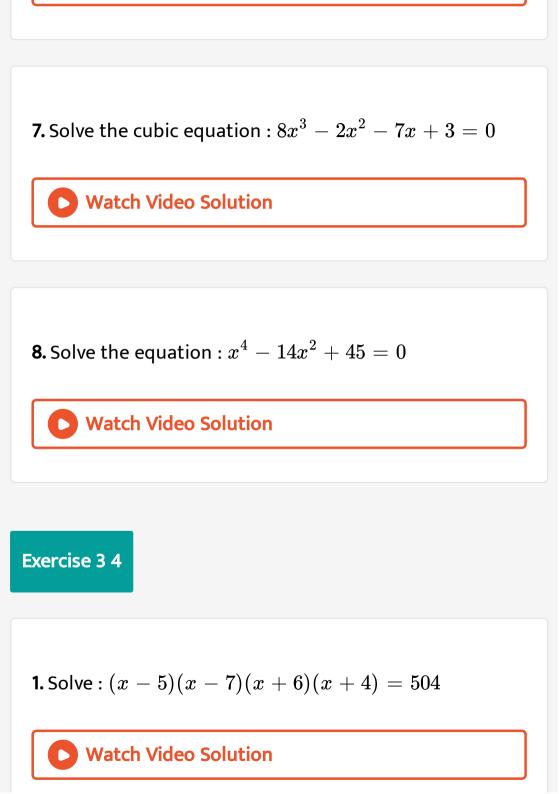
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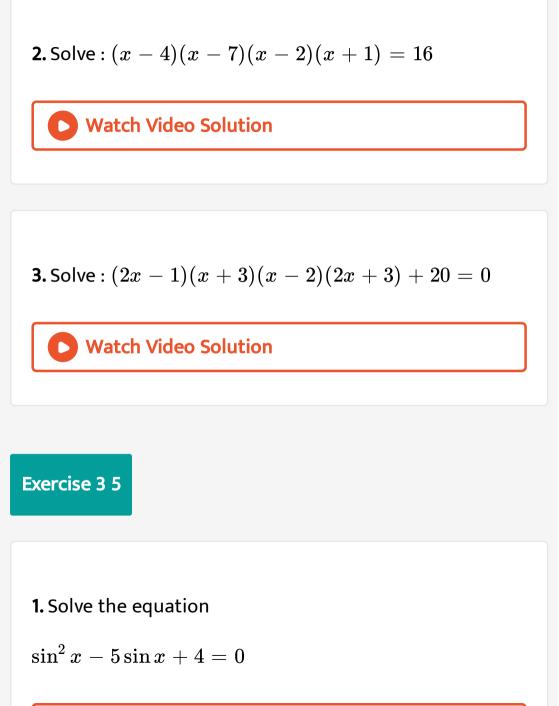
5. Find all zeros of the polynomial  $x^6 - 3x^5 - 5x^4 + 22x^3 - 39x^2 - 39x + 135$ , if it is known that 1 + 2i and  $\sqrt{3}$  are two of its zeros.

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**6.** Solve the cubic equation :  $2x^3 - 9x^2 + 10x = 3$ 

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2. Solve the equation

$$12x^3 + 8x = 29x^2 - 4$$

**D** Watch Video Solution

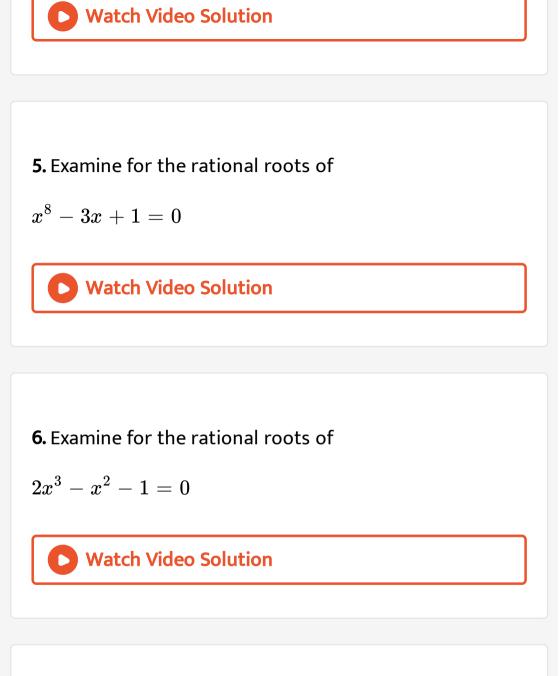
3. Solve the equation

 $\sin^2 x - 5\sin x + 4 = 0$ 

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4. Examine for the rational roots of

 $2x^3 - x^2 - 1 = 0$ 



7. Solve : 
$$8x^{rac{3}{2n}} - 8x^{rac{-3}{2n}} = 63$$



**8.** Sove : 
$$2\sqrt{rac{x}{a}} + 3\sqrt{rac{a}{x}} = rac{b}{a} + rac{6a}{b}$$

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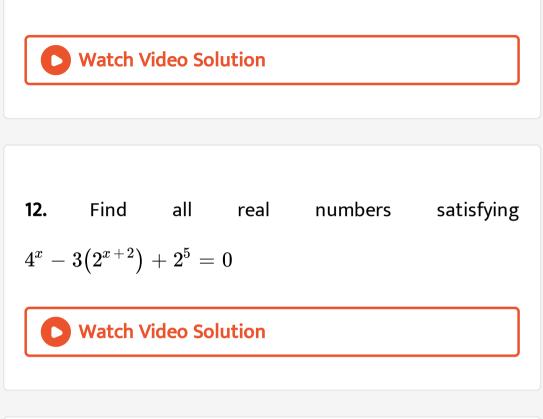
**9.** Solve : 
$$6x^4 - 35x^3 + 62x^2 - 35x + 6 = 0$$

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10. Solve the equations :  $x^4 + 3x^3 - 3x - 1 = 0$ 

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11. Solve : 
$$6x^4 - 35x^3 + 62x^2 - 35x + 6 = 0$$



**13.** Solve : 
$$6x^4 - 35x^3 + 62x^2 - 35x + 6 = 0$$

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Exercise 3 6

1. Discuss the maximum possible number of positive the negative roots of the polynomial equation  $9x^9 - 4x^8 + 4x^7 - 3x^6 + 2x^5 + x^3 + 7x^2 + 7x + 2 = 0$ 

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2. Discuss the maximum possibel number of positive the negative zeros of the polynomials  $x^2 - 5x + 6$  and  $x^2 - 5x + 16$ . Also draw rough sketch of the graphs.



3. Show that the equation  $x^9-5x^5+4x^4+2x^2+1=0$  has at least 6 imaginary solutions.

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**4.** Determine the number of positive and negative roots

of the equation  $x^9-5x^8-14x^7=0.$ 

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5. Find the exact number of real zeros and imaginary of

the polynomial  $x^9 + 9x^7 + 7x^5 + 5x^3 + 3x$ .





# Exercise 3 7

**1.** A zero of  $x^3 + 64$ is

**A.** 0

 $\mathsf{B.4}$ 

 $\mathsf{C.}\,4i$ 

 $\mathsf{D.}-4$ 

### **Answer:**



2. If find g are polynomials of derrees m and n respectively, and if  $h(x) = (f^{\circ}g)(x)$ , then the degree of h

is

A. mn

B. m+n

 $\mathsf{C}.\,m^n$ 

D.  $n^m$ 

### Answer:



**3.** A polynomial equation in x of degree n always has :

A. n distince roots

B. n imaginary roots

C. at most one root

D. n real roots

### Answer:

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**4.** If lpha, eta and  $\gamma$  are the zeros of  $x^3 + px^2 + qx + r$ , then  $\Sigma rac{1}{lpha}$  is

A. 
$$-\frac{q}{r}$$
  
B.  $-\frac{p}{r}$ 

C. 
$$\frac{q}{r}$$
  
D.  $-\frac{q}{p}$ 

### Answer:

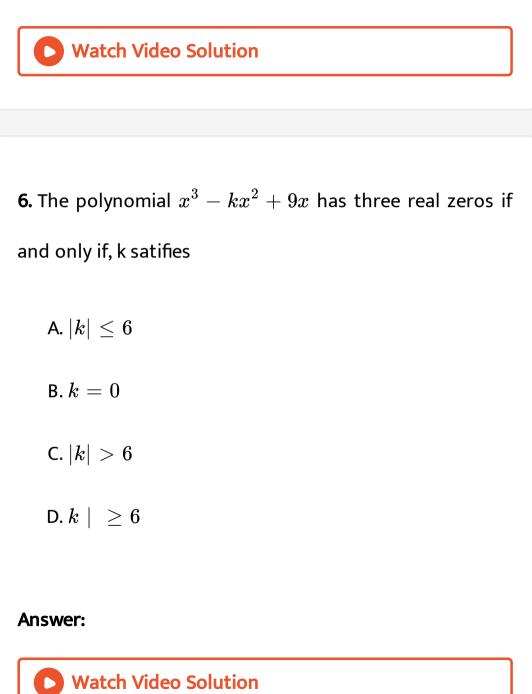


5. According to the rational root theorem, which number is not possible rational zero of  $4x^7 + 2x^4 - 10x^3 - 5$  ?

A. 
$$-1$$
  
B.  $\frac{5}{4}$   
C.  $\frac{4}{5}$ 

D. 5

## Answer:



7. The number of real numbers in  $[0,2\pi]$  satisfying  $\sin^4 x - 2\sin^2 x + 1$  is ......

 $\mathsf{A.}\,2$ 

 $\mathsf{B.4}$ 

**C**. 1

D.  $\propto$ 

### Answer:



8. If  $x^3 + 12x^2 + 10ax + 1999$  definitely has positive zero , if and only if .....

A.  $a \geq 0$ 

 $\mathsf{B.}\,a>0$ 

C. a < 0

D.  $a \leq 0$ 

### Answer:



**9.** The polynomial  $x^3 + 2x + 3$  has :

A. one negative and two imaginary zeros

B. one positive the two imaginary zeros

C. three real zeros

D. no zeros

### Answer:

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10. The number of positive zeros of the polynomial  $\sum\limits_{j=0}^{n} {}^n C_r {(-1)}^r x^r$  is

**A.** 0

B. *n* 

C. < n

D. *r* 

Answer:

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Additional Questions 1 Mark

1. If a, b, c  $\ \in \$  Q and  $p+\sqrt{2}q$  ( p, q  $\ \in \$  Q) is an irrational

root of  $ax^2 + bx + c = 0$  then the other root is

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**2.** The quadratic equation whose roots are  $\alpha$  and  $\beta$  is

A. 
$$(x-lpha)(x-eta)=0$$
  
B.  $(x-a)(x+eta)=0$   
C.  $lpha+eta-rac{b}{a}$   
D.  $lphaeta=rac{-c}{a}$ 

#### **Answer: A**

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**3.** If f(x) = 0 has n roots, then f'(x) = 0 has .....roots

B. n - 1

C. n + 1

 $\mathsf{D}.\left(n-r
ight)$ 

### Answer: B

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**4.** If x is real and 
$$k=rac{x^2-x+1}{x^2+x+1}$$
 then

A. 
$$rac{1}{3} \leq \mathsf{k} \ \leq 3$$

B.  $k \geq 5$ 

 $\mathsf{C}.\,k\leq 0$ 

D. none

## Answer: A



5. Let a>0, b>0, c>0. Then both the roots of the equation  $ax^2+bx+c=0$  are

A. real and negative

B. real and positive

C. retional numbers

D. none

Answer: B



**6.** The equation  $\sqrt{x+1} - \sqrt{x-1} = \sqrt{4x-1}$  has

A. no solution

B. one solution

C. two solution

D. more than one solution

### Answer: A

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7. If the roots of the equation  $x^3 + bx^2 + cx - 1 = 0$ 

form an increasing G.P, then

A. one of the roots is 2

B. one of the roots is 1

C. one of the roots is -1

D. one of the roots is -2

### Answer: B

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**8.** For real x, the equation 
$$\left|rac{x}{x-1}
ight|+|x|=rac{x^2}{|x-1|}$$
 has

A. one solution

B. two solution

C. at least two solution

## D. no solution

### Answer: C

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9. If the equation  $ax^2 + bx + c = 0 (a > 0)$  has two roots lpha and eta such that lpha < -2 and beta > 2, then

A. 
$$b^2 - 4ac = 0$$

$$\mathsf{B}.\,b^2-4ac<0$$

C. 
$$b^2-4ac>0$$

D. 
$$b^2-4ac\geq 0$$

#### Answer: C



10. If 
$$\left(2+\sqrt{3}
ight)^{x^2-2x+1}+\left(2-\sqrt{3}
ight)^{x^2-2x-1}=rac{2}{2-\sqrt{3}}$$

then x =

A. 0, 2

B. O, 1

C. O, 3

D. 0,  $\sqrt{3}$ 

## Answer: A

**Niew Text Solution** 

1. If  $lpha,eta,\gamma$  are the roots of the equation  $x^3-3x+11=0$ , then  $lpha+eta+\gamma$  is .....

**A.** 0

 $\mathsf{B.}\,3$ 

C. - 11

 $\mathsf{D.}-3$ 

**Answer: A** 

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2. If  $lpha,eta,\gamma$  are the roots of  $9x^3-7x+6=0$ , then  $lphaeta\gamma$  is .....

A. 
$$\frac{-7}{9}$$
  
B.  $\frac{7}{9}$   
C. 0  
D.  $\frac{-2}{3}$ 

#### Answer: D



**3.** If 
$$x^2 - hx - 21 = 0$$
 and  $x^2 - 3hx + 35 = 0(h > 0)$ 

have a common roots, then h =.....

A. 0

B.1

 $\mathsf{C.4}$ 

 $\mathsf{D.}\ 3$ 

## Answer: C

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**4.** If  $ax^2+bx+c=0, a, b, c\in R$  has no real zeros, and

if a + b + c + < 0, then

A. c>0

 $\mathsf{B.}\,c<0$ 

C. c = 0

D.  $c \leq 0$ 

Answer: B

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5. If  $p(x) = ax^2 + bx + c$  and  $Q(x) = -ax^2 + dx + c$ where ac  $\neq$  0 then p(x). Q(x) = 0 has at least ..... Real roots

A. no

B. 1

 $\mathsf{C.}\,2$ 

D. infinite

Answer: C

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Additional Questions Choose The Incorrect Statement

1. The equation 
$$4ax^2 + 3bx + 2c = 0$$
 where a, b, c are

real and a+b+c = 0 has

A. two imaginary roots

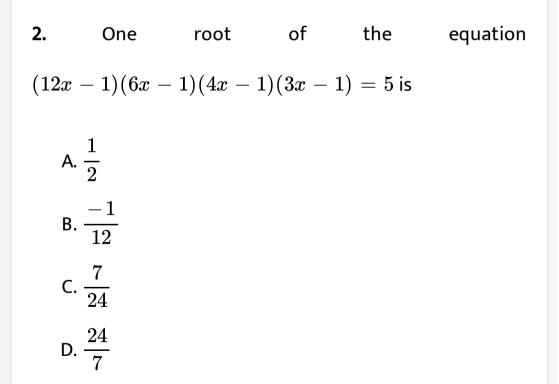
B. two real roots

C. one + ve & one - ve

#### D. 2 -ve roots

#### Answer: A

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Answer: D



3. The equation 
$$x^4 + 2ax^3 + x^3 + 2ax + 1 = 0$$
 has at

least two distinct negative roots is

A. 
$$a < rac{3}{4}$$

 $\mathsf{B.}\,a=1$ 

$$C. a = -1$$

$$\mathsf{D}.\,a=2$$

## Answer: C



4. If the equation 
$$ig(b^2+c^2ig)x^2-2(a+b)cx+ig(c^2+a^2ig)=0$$
 has equal roots, then

A. a, b, c are in G.P.

 $\mathsf{B.}\,c^2=ab$ 

C. a, b, c, are in G.P.

D.  $c=\sqrt{ab}$ 

**Answer: A** 



5. The values of x which satich satisty the equation  $|x^2 + 3x| + x^2 - 2 = 0$  are ...... A.  $\frac{-2}{2}$ 

B. 
$$\frac{1}{2}$$
  
C.  $\frac{2}{3}$ 

D. 
$$\frac{-2}{3}, \frac{1}{2}$$

## Answer: C



**Additional Questions** 

1. CHOOSE THE ADD MAN OUT :

A. 
$$x+rac{1}{2}=2$$
  
B.  $ax^2+bx+c=0$   
C.  $\sqrt{x}+rac{1}{\sqrt{x}}=4$   
D.  $ax^2+rac{b}{x}+c=0$ 

#### Answer: D

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2. CHOOSE THE ADD MAN OUT :

A. 
$$2x^2 + 7x - 2x + 7 = 0$$

$$\mathsf{B}.\,6x^2 - 6x^3 + 5 = 0$$

$$\mathsf{C.}-5+6x+5x^2-6x^3=0$$

D. 
$$9x^4 - 5x^3 + 5x^2 - 9 = 0$$

#### Answer: B

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# Additional Questions Choose The Add Man Out

1. CHOOSE THE ADD MAN OUT :

A. 
$$\left(rac{3}{5}
ight)^x = x - x^2 - 9$$

 $B.\sin x = 4$ 

C. `tan x = 1

 $\mathsf{D.}\cos x=7$ 

## Answer: C

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2. If 
$$c \neq 0$$
 and  $\frac{p}{2x} = \frac{a}{x+c} + \frac{b}{x-c}$  has two equal roots, then find p.

A. 
$$p=\left(\sqrt{a}-\sqrt{b}
ight)^2$$
  
B.  $\left(\sqrt{a}+\sqrt{b}
ight)^2$   
C.  $\left(\sqrt{a}\pm\sqrt{b}
ight)^2$ 

 $\mathsf{D}.\,0$ 

## Answer: D



3. If 
$$ax + by = 1$$
,  $cx^2 + dy^2 = 1$  have only one solution,  
then  $\frac{a^2}{c} + \frac{b^2}{d} = 1$  and  $x = \frac{a}{c}$ ,  $y = \frac{b}{d}$   
A.  $\frac{a^2}{c} + \frac{b^2}{d} = 1$   
B.  $x = \frac{a}{c}$   
C.  $x = \frac{c}{a}$   
D.  $y = \frac{b}{d}$ 

## Answer: C

# Additional Questions Match The Following

**1.** For the cubic equation  $x^3 + ax^2 + bx + c = 0$ 



## The Correct match is

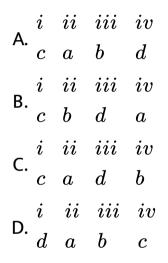
A.	i	ii	iii	iv
	a	b	iii c	d
Β.	i	ii	iii	iv
	b	c	$iii \ d$	a
C.	i	ii	$egin{array}{c} iii \ a \end{array}$	iv
	b	c	a	d
D.	i	ii	iii b	iv
	с	d	b	a

#### **Answer: B**

**2.** For the equation  $4x^2 + 4px + p2 = 0$ 

# 

The Correct match is.



## Answer: C





## The Correct match is

i ii iii iv A. b c d ai ii iii iv Β. a b c di ii iii iv  $\mathsf{C}. \begin{array}{c} b \\ b \\ c \\ a \end{array} d$ i ii iii ivD. c c a d

#### Answer: A



4. 🔛

The Correct match is.

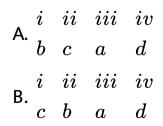


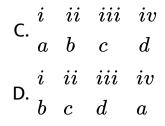
## Answer: D

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The Correct match is.





#### Answer: D

**O** View Text Solution

# 2 Marks

1. If 
$$\sin lpha, \cos lpha$$
 are the roots of the equation  $ax^2 + bx + c = 0 (c 
eq 0)$ , then prove that  $(a+c)^2 = b^2 + c^2$ .

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2. Find value of a for which the sum of the squares of the equation  $x^2 - (a-2)x - a - 1 = 0$  assumes the least value.



3. Find the interval for a for which 
$$3x^2 + 2(a^2 + 1)x + (a^2 - 3a + 2)$$
 possesses roots of opposite sign.

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**4.** Find x if 
$$x=\sqrt{2+\sqrt{2+\sqrt{+...+ ext{upto}\infty}}}$$

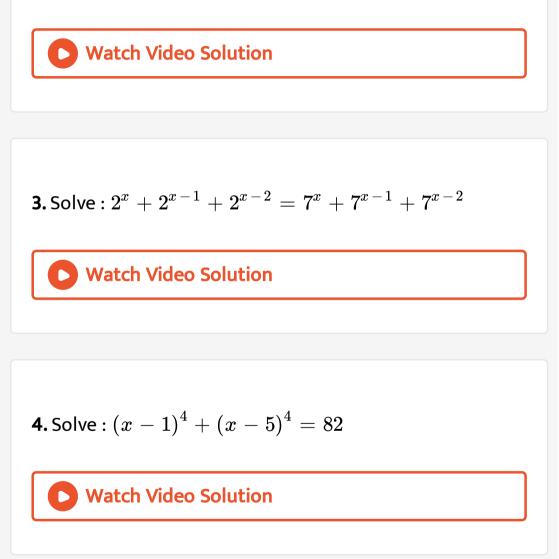
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5. Find the number of positive and negative roots of the equation  $x^7 - 6x^6 + 7x^5 + 5x^2 + 2x + 2$ 

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1. Find the number of real solutions of sin  $(e^x) = 5^x + 5^{-x}.$ Watch Video Solution 2. Find the number of positive integreal solutions of ( pairs of positive integers satisfying )  $x^2-y^2=353702.$ 



5. Solve : 
$$\left(5+2\sqrt{6}\right)^{x^2-3}+\left(5-2\sqrt{6}\right)^{x^2-3}=10$$

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# 4 Marks

**1.** If the sum of the roots of the quadratic equation  $ax^2 + bx + c = 0$  ( abc  $\neq 0$ ) is equal to the sum of the squares of their reciprocals, the sum of the squares of their reciprocals, then  $\frac{a}{c}$ ,  $\frac{b}{a}$ ,  $\frac{c}{b}$  are in H.P.

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2. If a, b, d and p are distinct non - zero real numberssuchthat

$$ig(a^2+b^2+c^2ig)p^2-2(ab+bc+cd)p+ig(b^2+c^2+d^2ig)\leq 0$$

then n. Prove that a, b, c, d are in G. P and ad = bc

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**3.** If 
$$c \neq 0$$
 and  $\frac{p}{2x} = \frac{a}{x+c} + \frac{b}{x-c}$  has two equal roots, then find p.

4. If the equation  $x^2+bx+ca=0$  and  $x^2+cx+ab=0$  have a common root and b
eq c, then

prove that their roots will satisfy the equation  $x^2+ax+bc=0.$ 

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5. Solve : 
$$(2x^2 - 3x + 1)(2x^2 + 5x + 1) = 9x^2$$
.

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