MATHS

BOOKS - CENGAGE

COMPLEX NUMBERS AND QUADRATIC EQUATIONS

Solved Examples And Exercises

1. Show that the equation $e^{\sin x} - e^{-\sin x} - 4 = 0$ has no real solution.

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2. Solve for $x : 4^x - 3^{x - \frac{1}{2}} = 3^{x + \frac{1}{2}} - 2^{2x - 1}$

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3. Solve for $x : \sqrt{x+1} - \sqrt{x-1} = 1.$

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4. If $x, y \in Rand2x^2 + 6xy + 5y^2 = 1, then \ |x| \leq \sqrt{5}$ b. $|x| \geq \sqrt{5}$ c. $y^2 \leq 2$ d. $y^2 \leq 4$

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5. If the roots $x^5 - 40x^4 + Px^3 + Qx^2 + Rx + S = 0$ are n G.P. and the sum of their reciprocals is 10, then $|S|$ is 4 b. 6 c. 8 d. none of these

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6. Show that for any triangle with sides $a, b, andc3(ab+bc+ca) < (a+b+c)^2 < 4(bc+ca+ab)$. When are the first two expressions equal ?

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7. For what value of m does the system of equations $3x + my = m, 2x - 5y = 20$ has solution satisfying the conditions $x > 0, y > 0$?

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8. Show that the square to $\left(\sqrt{26 - 15\sqrt{3}}\right) / \left(5\sqrt{2} - \sqrt{38 + 5\sqrt{3}}\right)$ is a rational number.

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9. If α, β are the roots of $x^2 + px + q = 0 and \gamma, \delta$ are the roots of $x^2 + rx + s = 0$, evaluate $(\alpha - \gamma)(\alpha - \delta)(\beta - \gamma)(\beta - \delta)$ in terms of $p, q, r, and s$. Deduce the condition that the equation has a common root.

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10. Let $f(x) = x^2 + bx + c, where b, c \in R.$ If $f(x)$ is a factor of both $x^4 + 6x^2 + 25$ and $3x^4 + 4x^2 + 28x + 5$, then the least value of $f(x)$ is: (a.) 2 (b.) 3 (c.) $5/2$ (d.) 4

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11. If the equation $ax^2 + bx + c = x$ has no real roots, then the equation $a(ax^2 + bx + c)^2 + b(ax^2 + bx + c) + c = x$ will have a. four real roots b. no real root c. at least two least roots d. none of these

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12. The value of expression $x^4 - 8x^3 + 18x^2 - 8x + 2$ when $x = 2 + \sqrt{3}$ a. 2 b. 1 c. 0 d. 3

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13. The exhaustive set of values of a for which inequation $(a-1)x^2-(a+1)x+a-1\geq 0$ is true $\forall x>2$ $(a)(-\infty, 1)$ $(b)\left[\frac{7}{3}, \infty\right)$ $(c)\left[\frac{3}{7}, \infty\right)$ (d) none of these

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14. If p, q, r, s are rational numbers and the roots of $f(x)=0$ are eccentricities of a parabola and a rectangular hyperbola, where $f(x)=px^3+qx^2+rx+s$,then $p+q+r+s=$ a. p b. $-p$ c. $2p$ d. 0

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15. If a_0, a_1, a_2, a_3 are all the positive, then $4a_0x^3+3a_1x^2+2a_2x+a_3=0$ has least one root in $(-1, 0)$ if (a) $a_0+a_2=a_1+a_3$ and $4a_0+2a_2>3a_1+a_3$ (b) $4a_0+2a_2<3a_1+a_3$ (c) $4a_0+2a_2=3a_1+a_0$and $4a_0+a_2<a_1+a_3$ (d) none of these

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16. If $ax^2+bx+c=0$ has imaginary roots and $a-b+c>0$ then the set of points (x, y) satisfying the equation $\left|a\left(x^2+\frac{y}{a}\right)+(b+1)x+c\right|=\left|ax^2+bx+c\right|+|x+y|$ consists of the region in the $xy-plane$ which is on or above the bisector of I and III quadrant on or above the bisector of II and IV quadrant on or below the bisector of I and III quadrant on or below the bisector of II and IV quadrant

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17. All the values of $'a'$ for which the quadratic expression $ax^2+(a-2)x-2$ is negative for exactly two integral values of x may lie in $\left[1, \frac{3}{2}\right]$ (b) $\left[\frac{3}{2}, 2\right)$ $[1, 2)$ (d) $[-1, 2)$

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18. If $a+b+c=0, a^2+b^2+c^2=4, thena^4+b^4+c^4$ is____.

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19. Find the solution set of the system $x + 2y + z = 1\ 2x - 3y - w = 2$

$x \geq 0, y \geq 0, z \geq 0, w \geq 0$

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20. mn squares of equal size are arranged to form a rectangle of dimension m by n, where m and n are natural numbers. Two square will be called neighbors if they have exactly one common side. A number is written in each square such that the number written in any square is the arithmetic mean of the numbers written in its neighboring squares. Show that this is possible only if all the numbers used are equal.

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21. Form a quadratic equation whose roots are $-4and6$.

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22. If a, b, c are odd integere then about that $ax^2 + bx + c = 0$, does not have rational roots

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23. if cosθ , sinϕ , sinθ are in g.p then check the nature of roots of $x^2 + 2\cot\phi . x + 1 = 0$

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24. If a ,b ,c are non zero rational no then prove roots of equation $(abc^2)x^2 + 3a^2cx + b^2cx - 6a^2 - ab + 2b^2 = 0$ are rational.

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25. If $ab + bc + ca = 0$, then solve $a(b - 2c)x^2 + b(c - 2a)x + c(a - 2b) = 0$.

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26. If roots of equation $3x^2 + 5x + 1 = 0 are (\sec\theta_1 - tan\theta_1) and (\cos ec\theta_2 - \cot\theta_2)$. Then find the equation whose roots are $(\sec\theta_1 + tan\theta_1) and (\cos ec\theta_2 + \cot\theta_2)$.

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27. If roots of the equation $ax^2 + bx + c = 0$ are $\alpha and \beta$, find the equation whose roots are $\frac{1}{\alpha}, \frac{1}{\beta}$ (ii) $-\alpha, -\beta$ (iii) $\frac{1-\alpha}{1+\alpha}, \frac{1-\beta}{1+\beta}$

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28. Form a quadratic equation with real coefficients whose one root is $3 - 2i$.

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29. If the roots of the quadratic equation $x^2 + px + q = 0$ are $\tan 30^\circ$ and $\tan 15^\circ$, respectively then the value of $2 + q - p$ is

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30. If a, b and c are in A.P. and one root of the equation $ax^2 + bc + c = 0$ is 2, the find the other root .

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31. If a is the root (having the least absolute value) or the equation $x^2 - bx - 1 = 0 (b \in R^+)$, then prove that `-1

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32. If α, β are roots of $x^2 - 3x + a = 0$, $a \in R$ and $\alpha < 1 < \beta$ then find the value of a.

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33. If $a < b < c < d$, then for any real non-zero λ, the quadratic equation $(x-a)(x-c) + \lambda(x-b)(x-d) = 0$,has

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34. The quadratic $x^2 + ax + b + 1 = 0$ has roots which are positive integers, then $\left(a^2 + b^2\right)$ can be equal to a.50 b. 37 c. 61 d. 19

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35. The sum of values of x satisfying the equation $\left(31+8\sqrt{15}\right)^{x^2-3}+1=\left(32+8\sqrt{15}\right)^{x^2-3}$ is a 3 b. 0 c. 2 d. none of these

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36. If α, β are real and distinct roots of $ax^2+bx-c=0andp, q$ are real and distinct roots of $ax^2+bx-|c|=0, where(a>0)$, then $\alpha, \beta \in (p, q)$ b. $\alpha, \beta \in [p, q]$ c. $p, q \in (\alpha, \beta)$ d. none of these

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37. Let $a \neq 0andp(x)$ be a polynomial of degree greater than 2. If $p(x)$ leaves reminders $aanda$ when divided respectively, by $x+aandx-a$, the remainder when $p(x)$ is divided by x^2-a^2 is $2x$ b. $-2x$ c. x d. x

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38. A quadratic equation with integral coefficients has two different prime numbers as its roots. If the sum of the coefficients of the equation is prime, then the sum of the roots is 2 b. 5 c. 7 d. 11

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39. If a, b, c are three distinct positive real numbers, the number of real and distinct roots of $a|x^2| + 2b|x| - c = 0$ is a.0 b. 4 c. 2 d. none of these

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40. Let a, b and c be real numbers such that $4a + 2b + c = 0$ and $ab < 0$.Then the equation $ax^2 + bx + c = 0$.

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41. If α, β are the roots of the equation $x^2 - 2x + 3 = 0$ obtain the equation whose roots are $\alpha^3 - 3\alpha^2 + 5\alpha - 2$ and $\beta^3 - \beta^2 + \beta = 5$

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42. If α, β are the roots of the equation $ax^2 + bx + c = 0$, then the value of $a\alpha^2 + c / a\alpha + b + (a\beta^2 + c) / (a\beta + b)$ is $\frac{b(b^2 - 2ac)}{4a}$ b. $\frac{b^2 - 4ac}{2a}$ c. $\frac{b(b^2 - 2ac)}{a^2 c}$ d. none of these

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43. If $a \in (-1, 1)$, then roots of the quadratic equation $(a-1)x^2 + ax + \sqrt{1-a^2} = 0$ are

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44. If one root is square of the other root of the equation $x^2 + px + q = 0$ then the relation between p and q is

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45. Let α, β be the roots of the quadratic equation $ax^2 + bx + c = 0$ and $\Delta = b^2 - 4ac \cdot If \alpha + \beta, \alpha^2 + \beta^2, \alpha^3 + \beta^3$ are in G.P. Then a.$\Delta \neq 0$ b. $b\Delta = 0$ c. $c\Delta = 0$ d. $\Delta = 0$

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46. Let α, β be the roots of $x^2 - x + p = 0 and \gamma, \delta$ are roots of $x^2 - 4x + q = 0$. If $\alpha, \beta, \gamma, \delta$ are in G.P., then the integral value of $pandq$, respectively, are $-2, -32$ b. $-2, 3$ c. $-6, 3$ d. $-6, -32$

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47. If $f(x) = x^2 + 2bc + 2c^2 andg(x) = -x^2 - 2cx + b^2$ are such that min $f(x) > max f(x)$, ten he relation between $bandc$ is a. no relation b. `0

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48. For the equation $3x^2 + px + 3 = 0, p > 0,$ if one of the root is square of the other, then p is equal to

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49. Let $f(x) = (1 + b^2)x^2 + 2bx + 1$ and let $m(b)$ the minimum value of $f(x)\cdot$ As b varies, the range of $m(b)$ is $[0, 1]$ (b) $\left(0, \frac{1}{2}\right]$ $\left[\frac{1}{2}, 1\right]$ (d) $(0, 1]$

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50. If $\alpha and \beta$ are the roots of the equation $x^2 + bc + c = 0$,where $c < a < b$ then a. $0 < \alpha < \beta$ b. $\alpha < 0 < \beta < |\alpha|$ c. $\alpha < \beta < 0$ d. $\alpha < 0 < |\alpha| < \beta$

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51. If $b > a,$ then the equation $(x - a)(x - b) - 1 = 0$ has (a) both roots in (a, b) (b) both roots in $(-\infty, a)$ (c) both roots in $(b, +\infty)$

(d)one root in $(-\infty, a)$ and the other in $(b, +\infty)$

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

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53. If the roots of the equation $x^2-2ax+a^2-a-3=0$ are real and less than 3, then (a)$a<2$ b. $2<-a\leq 3$ c. `34`

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54. A value of b for which the equations $x^2+bx-1=0$ and $x^2+x+b=0$ have one root in common is

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55. Let $p and q$ be real numbers such that $p \neq 0, p^3 \neq q, and p^3 \neq -q$. If $\alpha and \beta$ are nonzero complex numbers satisfying $\alpha+\beta=-p and \alpha^3+\beta^3=q$, then a quadratic equation having $\alpha/\beta and \beta/\alpha$ as its roots is A. $(p^3+q)x^2-(p^3+2q)x+(p^3+q)=0$

B. $(p^3+q)x^2-(p^3-2q)x+(p^3+q)=0$ C. $(p^3+q)x^2-(5p^3-2q)x+(p^3-q)=0$ D. $(p^3+q)x^2-(5p^3+2q)x+(p^3+q)=0$

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56. Let α, β be the roots of the equation $x^2-px+r=0 and \alpha/2, 2\beta$ be the roots of the equation $x^2-qx+r=0$. Then the value of r is $\frac{2}{9}(p-q)(2q-p)$ b. $\frac{2}{9}(q-p)(2q-p)$ c. $\frac{2}{9}(q-2p)(2q-p)$ d. $\frac{2}{9}(2p-q)(2q-p)$

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57. Let a, b, c be the sides of a triangle, where $a \neq b \neq c$ and $\lambda \in R$. If the roots of the equation $x^2 + 2(a+b+c)x + 3\lambda(ab+bc+ca) = 0$ are real. Then a.$\lambda < \frac{4}{3}$ b. $\lambda > \frac{5}{3}$ c. $\lambda \in \left(\frac{1}{3}, \frac{5}{3}\right)$ d. $\lambda \in \left(\frac{4}{3}, \frac{5}{3}\right)$

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58. Let S be the set of all non-zero real numbers such that the quadratic equation $\alpha x^2 - x + \alpha = 0$ has two distinct real roots $x_1 and x_2$ satisfying the inequality $|x_1 - x_2| < 1.$ Which of the following intervals is (are) a subset (s) of S? $\left(\frac{1}{2}, \frac{1}{\sqrt{5}}\right)$ b. $\left(\frac{1}{\sqrt{5}}, 0\right)$ c. $\left(0, \frac{1}{\sqrt{5}}\right)$ d. $\left(\frac{1}{\sqrt{5}}, \frac{1}{2}\right)$

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59. For real x, the rucntion $\frac{(x-a)(x-b)}{(x-c)}$ will assume all real values provided

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60. The quadratic equation $p(x) = 0$ with real coefficients has purely imaginary roots. Then the equation $p(p(x)) = 0$ has A. only purely imaginary roots B. all real roots C. two real and purely imaginary roots D. neither real nor purely imaginary roots

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61. Let $\alpha \text{ and } \beta$ be the roots of equation $x^2 - 6x - 2 = 0. If a_n = \alpha^n - \beta^n, \text{for} n \geq 1,$ then the value of $\dfrac{a_{10} - 2a_8}{2a_9}$ is

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62. For the following question, choose the correct answer from the codes (a), (b), (c) and (d) defined as follows: Statement I is true, Statement II is also true; Statement II is the correct explanation of Statement I.

Statement I is true, Statement II is also true; Statement II is not the correct explanation of Statement I. Statement I is true; Statement II is false Statement I is false; Statement II is true. Let a, b, c, p, q be the real numbers. Suppose α, β are the roots of the equation $x^2 + 2px + q = 0$ and $\alpha, \frac{\beta}{2}$ are the roots of the equation $ax^2 + 2bx + c = 0$, where $\beta^2 \notin \{-1, 0, 1\}$. Statement I $(p^2 - q)(b^2 - ac) \geq 0$ and Statement II $b \notin pa$ or $c \notin qa$.

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63. All the values of m for which both roots of the equation $x^2 - 2mx + m^2 - 1 = 0$ are greater than -2 but less than 4, lie in the interval

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64. If the roots of the quadratic equation $(4p - p^2 - 5)x^2 - (2p - 1)x + 3p = 0$ lie on either side of unit, then

the number of integer values of p is a.1 b. 2 c. 3 d. 4

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65. If roots of $x^2 - (a-3)x + a = 0$ are such that at least one of them is greater than 2, then $a \in [7, 9]$ b. $a \in [7, \infty]$ c. $a \in [9, \infty]$ d. $a \in [7, 9]$

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66. Let $f(x) = ax^2 + bx + a, b, c \in R$. If $f(x)$ takes real values for real values of x and non-real values for non-real values of x , then $a = 0$ b. $b = 0$ c. $c = 0$ d. nothing can be said about $a, b, \cdot$

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67. If both roots of the equation $ax^2 + x + c - a = 0$ are imaginary and $c > -1,$ then a.$3a > 2 + 4c$ b.$3a < 2 + 4c$ c.$c < a$ d. none of these

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68. Find the set of all possible real value of a such that the inequality $(x-(a-1))\left(x-\left(a^2+2\right)\right)<0$ holds for all $x \in (-1, 3)$.

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69. The interval of a for which the equation $tan^2x-(a-4)\tan x+4-2a=0$ has at least one solution $\forall x \in [0, \pi/4]$ $a \in (2, 3)$ b. $a \in [2, 3]$ c. $a \in (1, 4)$ d. $a \in [1, 4]$

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70. The range of a for which the equation $x^2+ax-4=0$ has its smaller root in the interval $(-1, 2) is$ a. $(-\infty, -3)$ b. $(0, 3)$ c. $(0, \infty)$ d. $(-\infty, -3) \cup (0, \infty)$

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71. Consider the equation $x^2 + 2x - n = 0$ where $n \in N$ and $n \in [5, 100]$ The total number of different values of n so that the given equation has integral roots is a.8 b. 3 c. 6 d. 4

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72. The total number of values a so that $x^2 - x - a = 0$ has integral roots, where $a \in Nand6 \leq a \leq 100$, is equal to a.2 b. 4 c. 6 d. 8

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73. Let $P(x) = x^3 - 8x^2 + cx - d$ be a polynomial with real coefficients and with all it roots being distinct positive integers. Then number of possible value of c is__________.

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74. Let $P(x) = \frac{5}{3} - 6x - 9x^2 and Q(y) = -4y^2 + 4y + \frac{13}{2}$. if there exists unique pair of real numbers (x, y) such that $P(x)Q(y) = 20$, then the value of $(6x + 10y)$ is ____.

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75. if a $< c < b,$ then check the nature of roots of the equation $(a - b)^2 x^2 + 2(a + b - 2c)x + 1 = 0$

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76. If $a, b, c \in R^+ and 2b = a + c,$ then check the nature of roots of equation $ax^2 + 2bx + c = 0.$

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77. The value of a for which the sum of the squares of the roots of the equation $x^2 - (a-2)x - a - 1 = 0$ assume the least value is

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78. If $x_1, and x_2$ are the roots of $x^2 + (\sin\theta - 1)x - \frac{1}{2}(\cos^2\theta) = 0$, then find the maximum value of $x_1^2 + x_2^2$

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79. If $p, q \in \{1, 2, 3, 4, 5\}$, then find the number of equations of form $p^2x^2 + q^2x + 1 = 0$ having real roots.

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80. Find the domain and the range of $f(x) = \sqrt{x^2 - 3x + 2.}$

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81. Find the domain and range of $f(x)=\sqrt{3-2x-x^2}$

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82. Prove that if the equation $x^2+9y^2-4x+3=0$ is satisfied for real values of $x and y, then x$ must lie between 1 and 3 and y must lie between-1/3 and 1/3.

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83. Find the least value of $\frac{(6x^2-22x+21)}{(5x^2-18+17)}$ for real $x\cdot$

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84. Find the range of the function $f(x)=x^2-2x-4.$

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85. Find he linear factors of $2x^2 - y^2 - x + xy + 2y - 1$.

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86. The value(s) of m for which the expression $2x^2 + mxy + 3y^2 - 5y - 2$ can be factorized in to two linear factors are:

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87. If $a_1x^3 + b_1x\hat{A}^2 + c_1x + d_1 = 0$ and $a_2x^3 + b_2x^2 + c_2x + d_2 = 0$ have a pair of repeated roots common, then prove that

$$\begin{vmatrix} 3a_1 & 2b_1 & c_1 \\ 3a_2 & 2b_2 & c_2 \\ a_2b_1 - a_1b_2 & c_1a_2 - c_2a_1 & d_1a_2 - d_2a_1 \end{vmatrix} = 0$$

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88. If $x - c$ is a factor of order m of the polynomial $f(x)$ of degree n $(1 < m < n)$, then find the polynomials for which $x = c$ is a root.

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89. Solve the equation $x^3 - 13x^2 + 15x + 189 = 0$ if one root exceeds the other by 2.

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90. If $\tan\theta and \sec\theta$ are the roots of $ax^2 + bx + c = 0$, then prove that $a^4 = b^2(b^2 - 4ac)$.

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91. If the roots of the equation $x^2 - bx + c = 0$ are two consecutive integers, then $b^2 - 4c$ is

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92. For what real values of a do the roots of the equation $x^2 - 2x - (a^2 - 1) = 0$ lie between the roots of the equation $x^2 - 2(a+1)x + a(a-1) = 0$.

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93. Find the value of a for which the equation a $\sin\left(x + \frac{\pi}{4}\right) = \sin 2x + 9$ will have real solution.

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94. Let a, b and c be real numbers such that $a + 2b + c = 4$. Find the maximum value of $(ab + bc + ca)$.

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95. Prove that for real values of x, $\left(ax^2 + 3x - 4\right) / \left(3x - 4x^2 + a\right)$ may have any value provided a lies between 1 and 7.

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96. Prove that for all real values of $x and y, x^2 + 2xy + 3y^2 - 6x - 2y \geq -11.$

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97. The values of 'a' for which the equation $\left(x^2 + x + 2\right)^2 - (a - 3)\left(x^2 + x + 2\right)\left(x^2 + x + 1\right) + (a - 4)\left(x^2 + x + 1\right)$ has atlesast one real root is:

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98. Find the values of a for whilch the equation $\sin^4 x + a\sin^2 x + 1 = 0$ will have a solution.

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99. Find all the value of m for which the equation $\sin^2 x - (m-3)\sin x + m = 0$ has real roots.

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100. If α is a real root of the quadratic equation $ax^2 + bx + c = 0 and \beta$ ils a real root of $-ax^2 + bx + c = 0,$ then show that there is a root γ of equation $(a/2)x^2 + bx + c = 0$ whilch lies between $\alpha \& \beta$

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101. Find the condition if the roots of $ax^2 + 2bx + c = 0 and bx^2 - 2\sqrt{ac}x + b = 0$ are simultaneously real.

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102. Solve $\left(x^2 - x - 1\right)\left(x^2 - x - 7\right) < -5.$

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103. Solve the equation $x^4 - 5x^2 - 6x - 5 = 0.$

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104. Solve $\dfrac{x^2 - 2x - 3}{x + 1} = 0.$

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105. Solve $\left(x^3 - 4x\right)\sqrt{x^2 - 1} = 0.$

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106. Solve $\dfrac{2x - 3}{x - 1} + 1 = \dfrac{6x - x^2 - 6}{x - 1}.$

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107. Using differentiation method check how many roots of the equation $x^3 - x^2 + x - 2 = 0$ are real?

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108. Find the roots of the following equations:

$x - \frac{1}{x} = 3, x \neq 0$

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109. Find how many roots of the equations $x^4 + 2x^2 - 8x + 3 = 0$.

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110. How many real solutions does the equation $x^7 + 14x^5 + 16x^3 + 30x - 560 = 0$ have?

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111. Solve $\sqrt{5x^2 - 6x + 8} - \sqrt{5x^2 - 6x - 7} = 1.$

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112. Solve $\sqrt{3x^2 - 7x - 30} + \sqrt{2x^2 - 7x - 5} = x + 5.$

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113. If $x = \sqrt{7 + 4\sqrt{3}},$ prove that $x + 1/x = 4$

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114. Solve $\sqrt{5x^2 - 6x + 8} + \sqrt{5x^2 - 6x - 7} = 1.$

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115. Solve $\sqrt{x^2+4x-21}+\sqrt{x^2-x-6}=\sqrt{6x^2-5x-39.}$

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116. Solve $4^x+6^x=9^x.$

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117. Solve $3^{2x^2-7x+7}=9.$

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118. How many solutions does the equation $\frac{8^x+27^x}{12^x+18^x}$ = $\frac{7}{6}$have? (A) Exactly one (B) Exactly two (C) Finitely many (D) Infinitely many

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119. Find the number of real roots of the equation $(x-1)^2+(x-2)^2+(x-3)^2=0.$

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120. How many roots of the equation $3x^4+6x^3+x^2+6x+3=0$ are real ?

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121. Find the value of k if $x^3-3x+k=0$ has three real distinct roots.

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122. a, b, and c are all different and non-zero real numbers on arithmetic progression. If the roots of quadratic equation $ax^2+bx+c=0\ are\ \alpha$

and β such that $\frac{1}{\alpha}+\frac{1}{\beta}, \alpha+\beta, and \alpha^2+\beta^2$ are in geometric progression the value of a/c will be____.

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123. Let $x^2+y^2+xy+1 \geq a(x+y)\ \forall x, y \in R,$ then the number of possible integer (s) in the range of a is_________.

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124. The quadratic equation $x^2+mx+n=0$ has roots which are twice those of $x^2+px+m=0 adm, n and p \neq 0.$ The n the value of n/p is _____.

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125. All the value of k for which the quadratic polynomial $f(x)=-2x^2+kx+k^2+5$ has two distinct zeroes and only one of them satisfying $0 < x < 2$,lie in the interval (a, b) The value of $(a+10b)$ is

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126. Let $a, b, andc$ be rel numbers which satisfy the equation $a+\frac{1}{bc}=\frac{1}{5}, b+\frac{1}{ac}=\frac{-1}{15}, andc+\frac{1}{ab}=\frac{1}{3}$. The value of $\frac{c-b}{c-a}$ is equal to ________.

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127. If α, β are the roots of the quadratic equation $ax^2+bx+c=0$, then which of the following expression will be the symmetric function of roots a. $\left|\log\left(\frac{\alpha}{\beta}\right)\right|$ b. $\alpha^2\beta^5+\beta^2\alpha^5$ c. $tan(\alpha-\beta)$ d. $\left(\log\left(\frac{1}{\alpha}\right)\right)^2+(\log\beta)^2$

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128. If a, b, c are non-zero real numbers, then the minimum value of the expression $\left(\frac{(a^4+3a^2+1)(b^4+5b^2+1)(c^4+7c^2+1)}{a^2b^2c^2}\right)$ is not divisible by prime number.

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129. Referred to the principal axes as the axes of co ordinates find the equation of hyperbola whose focii are at $(0, \pm\sqrt{10})$ and which passes through the point $(2, 3)$

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130. If the equation $ax^2+bx+c=0 (a>0)$ has two roots α and β such that α < -2 $\text{and beta} > 2$, then

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131. Let

$f(x) = ax^2 + bx + c. Consider the follow \in g diagram. Then Fig$ c<0b

>0a+b-c >0a b c<0`

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132. If $c \neq 0$ and the equation $p/(2x) = a/(x+c) + b/(x-c)$ has two equal roots, then p can be $\left(\sqrt{a} - \sqrt{b}\right)^2$ b. $\left(\sqrt{a} + \sqrt{b}\right)^2$ c. $a + b$ d. $a - b$

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133. If the equation $4x^2 - x - 1 = 0 and 3x^2 + (\lambda + \mu)x + \lambda - \mu = 0$ have a root common, then the rational values of $\lambda and \mu$ are a.$\lambda = \frac{-3}{4}$ b. $\lambda = 0$ c. $\mu = \frac{3}{4}$ b.$\mu = 0$

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134. If the equation whose roots are the squares of the roots of the cubic $x^3 - ax^2 + bx - 1 = 0$ is identical with the given cubic equation, then (a)$a = 0, b = 3$ b. $a = b = 0$ c. $a = b = 3$ d. $a, b,$ are roots of $x^2 + x + 2 = 0$

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135. If the equation $ax^2 + bx + c = 0, a, b, c, \in R$ have none-real roots, then a.$c(a - b + c) > 0$ b. $c(a + b + c) > 0$ c. $c(4a - 2b + c) > 0$ d. none of these

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136. If $p(q - r)x^2 + q(r - p)x + r(p - q) = 0$ has equal roots, then prove that $\frac{2}{q} = \frac{1}{p} + \frac{1}{r}$.

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137. Let $\alpha, \beta \in R$. If α, β^2 are the roots of quadratic equation $x^2 - px + 1 = 0.\ and \alpha^2, \beta$ are the roots of quadratic equation $x^2 - qx + 8 = 0$, then find p, q, α, β.

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138. If p and q are the roots of the equation $x^2 + px + q = 0$, then

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139. If $s \int h\eta, \cos\theta$ be the roots of $ax^2 + bx + c = 0$, then prove that $b^2 = a^2 + 2ac$.

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140. If the sum of the roots of the equation $\frac{1}{x+a} + \frac{1}{x+b} = 1/c$ is zero, the prove that the product of the root is $\left(-\frac{1}{2}\right)(a^2 + b^2)$.

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141. Solve the equation $x^2 + px + 45 = 0$ It is given that the squared difference of its roots is equal to 144

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142. If α, β are the roots of the equation $2x^2 - 35x + 2 = 0$, the find the value of $(2\alpha - 35)^3(2\beta - 35)^3$.

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143. Find a quadratic equation whose product of roots $x_1 and x_2$ is equal to 4 an satisfying the relation $\frac{x_1}{x_1 - 1} + \frac{x_2}{x_2 - 1} = 2.$

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144. If a and $b(\neq 0)$ are the roots of the equation $x^2 + ax + b = 0$, then find the least value of $x^2 + ax + b(x \in R)$.

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145. If the sum of the roots of the equation $(a+1)x^2 + (2a+3)x + (3a+4) = 0$, is -1.Find its product.

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146. The quadratic polynomial $p(x)$ has the following properties: $p(x) \geq 0$ for all real numbers, $p(1) = 0 and p(2) = 2$. Find the value of $p(3)$ is________.

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147. function f , R $\rightarrow$ R , $f(x)=\frac{3x^2+mx+n}{x^2+1}$, if the range of function is [-4,3), find the value of |m+n| is ....

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148. If $\left(x^2+px+1\right)$ is a factor of $\left(ax^3+bx+c\right), then$ a. $a^2+c^2=-ab$ b. $a^2-c^2=-ab$ c. $a^2-c^2=ab$ d. none of these

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149. If α, β are the roots of $x^2-px+q=0 and \alpha', \beta'$ are the roots of $x^2-p'x+q'=0,$ then the value of $(\alpha-\alpha')^2+(\beta-\alpha')^2+(\alpha-\beta')^2+(\beta-\beta')^2$ is a. $2\{p^2-2q+p'^2-2q'-pp'\}$ b. $2\{p^2-2q+p'^2-2q'-qq'\}$ c. $2\{p^2-2q-p'^2-2q'-pp'\}$ d.$2\{p^2-2q-p'^2-2q'-qq'\}$

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150. If $(ax^2 + c)y + (a'x^2 + c') = 0$ and x is a rational function of y and ac is negative, then

a. $ac' + c'c = 0$

b. $a/a' = c/c'$

c. $a^2 + c^2 = a'^2 + c'^2$

d. $aa' + cc' = 1$

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151. The sum of the non-real root of $(x^2 + x - 2)(x^2 + x - 3) = 12$ is a. -1 b. 1 c. -6 d. 6

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152. The number of roots of the equation $\sqrt{x-2}(x^2 - 4x + 3) = 0$ is

(A) Three (B) Four (C) One (D) Two

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153. If $(1+i)$ is a root of the equation $x^2 - x + (1-i) = 0$, then the other root is

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154. The number of irrational roots of the equation $\frac{4x}{x^2+x+3} + \frac{5x}{x^2-5x+3} = -\frac{3}{2}$ is (a)4 b. 0 c. 1 d. 2

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155. If the equation $x^2 - 3px + 2q = 0 and x^2 - 3ax + 2b = 0$ have a common roots and the other roots of the second equation is the reciprocal of the other roots of the first, then $(2-2b)^2$. a.$36pa(q-b)^2$ b. $18pa(q-b)^2$ c. $36bq(p-a)^2$ d. $18bq(p-a)^2$

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156. Solve the equation $3^{x^2-x}+4^{x^2-x}=25.$

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157. Solve : $12x^4-56x^3+89x^2-56x+12=0$

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158. Solve the equation $(x+2)(x+3)(x+8)\times(x+12)=4x^2.$

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159. Solve: $\sqrt{x+5}+\sqrt{x+21}=\sqrt{6x+40}$

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160. If the expression $ax^4 + bx^3 - x^2 + 2x + 3$ has remainder $4x + 3$ when divided by $x^2 + x - 2$, find the value of $a and b$.

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161. Given that $x^2 + x - 6$ is a factor of $2x^4 + x^3 - ax^2 + bx + a + b - 1$, find the value of $a and b$.

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162. If p, q, r are positive and are in A.P., the roots of quadratic equation $px^2 + qx + r = 0$ are all real for a.$\left|\frac{r}{p} - 7\right| \geq 4\sqrt{3}$ b. $\left|\frac{p}{r} - 7\right| \geq 4\sqrt{3}$ c. all p and r d. no p and r

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163. The number of points of intersection of two curves $y = 2\sin x and y = 5x^2 + 2x + 3 is$ a .0 b. 1 c. 2 d. ∞

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164. If $\alpha and \beta$ are the roots of $x^2 + px + q = 0 and \alpha^4, \beta^4$ are the roots of $x^2 - rx + s = 0$, then the equation $x^2 - 4qx + 2q^2 - r = 0$ has always. A. one positive and one negative root B . two positive roots C . two negative roots D . cannot say anything

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165. If $a^2 + b^2 + c^2 = 1, then ab + bc + ca$ lie in the interval $\left[\frac{1}{3}, 2\right]$ b. $[-1, 2]$ c. $\left[-\frac{1}{2}, 1\right]$ d. $\left[-1, \frac{1}{2}, \right]$

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166. Let α, β be the roots of the equation $(x-a)(x-b)=c, c \neq 0.$ Then the roots of the equation $(x-\alpha)(x-\beta)+c=0$ are a, c b. b, c c. a, b d. $a+c, b+c$

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167. Let a, b, c be real numbers, $a \neq 0.$ If α is a zero of $a^2x^2+bx+c=0, \beta$ is the zero of $a^2x^2-bx-c=0$ and $0, \alpha<\beta$ then prove that the equation $a^2x^2+2bx+2c=0$ has a root γ that always satisfies $\alpha<\gamma<\beta.$

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168. If $\left(x^2+px+1\right)$ is a factor of $\left(ax^3+bx+c\right), then$ a. $a^2+c^2=-ab$ b. $a^2-c^2=-ab$ c. $a^2-c^2=ab$ d. none of these

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169. Both the roots of the equation $(x-b)(x-c)+(x-a)(x-c)+(x-a)(x-b)=0$ are always a. positive b. real c. negative d. none of these

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170. The equation $x-\frac{2}{x-1}=1-\frac{2}{x-1}$ has a. no root b. one root c. two equals roots d. Infinitely many roots

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171. Two towns A and B are 60 km a part. A school is to be built to serve 150 students in town A and 50 students in town B. If the total distance to be travelled by all 200 students is to be as small as possible, then the school be built be a. town B b. 45 km from town A c. town A d. 45 km from town B

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172. Find the condition on a, b, c, d such that equations $2ax^3 + bx^2 + cx + d = 0 and 2ax^2 + 3bx + 4c = 0$ have a common root.

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173. Let $f(x), g(x)$, and $h(x)$ be the quadratic polynomials having positive leading coefficients and real and distinct roots. If each pair of them has a common root, then find the roots of $f(x) + g(x) + h(x) = 0.$

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174. If a, b, c be the sides of ABC and equations $ax^2 + bx + c = 0 and 5x^2 + 12x + 13 = 0$ have a common root, then find $\angle C$.

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175. If $b^2 < 2ac$, then prove that $ax^3 + bx^2 + cx + d = 0$ has exactly one real root.

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176. If two roots of $x^3 - ax^2 + bx - c = 0$ are equal inn magnitude but opposite in signs, then prove that `a b=c

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177. If $\alpha, \beta and \gamma$ are the roots of $x^3 + 8 = 0$ then find the equation whose roots are $\alpha^2, \beta^2 and \gamma^2$.

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178. If α, β, γ are the roots of the equation $x^3 - px + q = 0,$ then find the cubic equation whose roots are $\frac{\alpha}{1+\alpha}, \frac{\beta}{1+\beta}, \frac{\gamma}{1+\gamma}$.

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179. If the roots of equation $x^3 + ax^2 + b = 0 are \alpha_1, \alpha_2$ and $\alpha_3 (a, b \neq 0)$, then find the equation whose roots are $\frac{\alpha_1\alpha_2 + \alpha_2\alpha_3}{\alpha_1\alpha_2\alpha_3}, \frac{\alpha_2\alpha_3 + \alpha_3\alpha_1}{\alpha_1\alpha_2\alpha_3}, \frac{\alpha_1\alpha_3 + \alpha_1\alpha_2}{\alpha_1\alpha_2\alpha_3}$

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180. If $\alpha, \beta and \gamma$ are roots of $2x^3 + x^2 - 7 = 0$, then find the value of $\sum\left(\frac{\alpha}{\beta} + \frac{\beta}{\alpha}\right)$.

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181. Let $r, s, and t$ be the roots of equation $8x^3 + 1001x + 2008 = 0.$ Then find the value of $(r + s)^3 + (s + t)^3 + (t + r)^3$.

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182. The number of value of k for which $\left[x^2-(k-2)x+k^2\right]\times\left[x^2+kx+(2k-1)\right]$ is a perfect square is a.2 b. 1 c. 0 d. none of these

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183. The total number of integral values of a so that $x^2-(a+1)x+a-1=0$ ha integral roots is equal to a.1 b. 2 c. 4 d. none of these

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184. The number of positive integral solutions of $x^4-y^4=3789108$ is a. 0 b. 1 c. 2 d. 4

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185. If α, β are the roots of $x^2 + px + q = 0 adnx^{2n} + p^n x^n + q^n = 0$ and $lf(\alpha / \beta), (\beta / \alpha)$ are the roots of $x^n + 1 + (x + 1)^n = 0, the \cap (\in N)$ a. must be an odd integer b. may be any integer c. must be an even integer d. cannot say anything

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186. If α, β, γ are such that $\alpha + \beta + \gamma = 2, \alpha^2 + \beta^2 + \gamma^2 = 6, \alpha^3 + \beta^3 + \gamma^3 = 8, then \alpha^4 + \beta^4 + \gamma^4$ is a. 18 b. 10 c. 15 d. 36

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187. If $xy = 2(x + y), x \leq y and x, y \in N,$ then the number of solutions of the equation are a. two b. three c. no solution d. infinitely many solutions

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188. The number of real solutions of the equation $(9/10)^x = -3 + x - x^2$ is a. 2 b. 0 c. 1 d. none of these

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189. The number of integral values of a for which the quadratic equation $(x + a)(x + 1991) + 1 = 0$ has integral roots are a. 3 b.0 c.1 d. 2

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190. If the equation $\cot^4 x - 2\cos ec^2 x + a^2 = 0$ has at least one solution, then the sum of all possible integral values of a is equal to 4 (b) 3 (c) 2 (d) 0

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191. The number of real solutions of $|x| + 2\sqrt{5 - 4x - x^2} = 16$ is/are a. 6 b. 1 c. 0 d. 4

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192. If the quadratic equation $ax^2 + bx + 6 = 0$ does not have real roots and $b \in R^+$, then prove that $a > max\left\{\frac{b^2}{24}, b - 6\right\}$

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193. What is the minimum height of any point on the curve $y = x^2 - 4x + 6$ above the x-axis?

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194. What is the minimum height of any point on the curve $y = -x^2 + 6x - 5$ above the x-axis?

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195. Find the largest natural number a for which the maximum value of $f(x) = a - 1 + 2x - x^2$ is smaller than the minimum value of $g(x) = x^2 - 2ax + 10 - 2a$.

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196. Let $f(x) = ax^2 + bx + c$ be a quadratic expression having its vertex at (3, -2) and value of `f(0)=10. find f(x)

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197. Find the least value of n such that $(n-2)x^2 + 8x + n + 4 > 0, \forall x \in R, where n \in N$.

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198. If the inequality $\left(mx^2+3x+4\right)/\left(x^2+2x+2\right)<5$ is satisfied for all $x \in R$, then find the value of $m\cdot$

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199. If $f(x)=\left(a_1x+b_1\right)^2+\left(a_2x+b_2\right)^2+\ldots+\left(a_nx+b_n\right)^2$, then prove that $\left(a_1b_1+a_2b_2+\ +a_nb_n\right)^2 \leq \left(a12+a22+\ +an2\right)^{b12+b22+\ +bn2}.$

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200. If c is positive and $2ax^2+3bx+5c=0$ does not have aby real roots, then prove that $2a-3b+5b>0.$

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201. If $ax^2+bx+6=0$ does not have distinct real roots, then find the least value of $3a+b\cdot$

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202. A quadratic trinomial $P(x) = ax^2 + bx + c$ is such that the equation $P(x) = x$ has no real roots. Prove that in this case equation $P(P(x)) = x$ has no real roots either.

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203. Let $a, b, c \in Q^+$ satisfying $a > b > c\cdot$ Which of the following statements (s) hold true of the quadratic polynomial $f(x) = (a + b - 2c)x^2 + (b + c - 2a)x + (c + a - 2b)$? A) The mouth of the parabola $y = f(x)$ opens upwards B) Both roots of the equation $f(x) = 0$ are rational C) The x-coordinate of vertex of the graph is positive D) The product of the roots is always negative

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204. If $x, y \in R$ satify the equation $x^2 + y^2 - 4x - 2y + 5 = 0$, then the value of the expression $\left[\left(\sqrt{x} - \sqrt{y}\right)^2 + 4\sqrt{xy}\right] / \left(x + \sqrt{xy}\right)$ is a. $\sqrt{2} + 1$ b. $\frac{\sqrt{2} + 1}{2}$ c. $\frac{\sqrt{2} - 1}{2}$ d. $\frac{\sqrt{2} + 1}{\sqrt{2}}$

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205. If $x = 1 + \frac{1}{3 + \frac{1}{2 + \frac{1}{3 + \frac{1}{2\infty}}}}$ a $\sqrt{\frac{5}{2}}$ b. $\sqrt{\frac{3}{2}}$ c. $\sqrt{\frac{7}{3}}$ d. $\sqrt{\frac{5}{3}}$

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206. Find the values of a for which the roots of the equation $x^2 + a^2 = 8x + 6a$ are real.

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207. If $x = 2 + 2^{2/3} + 2^{2/3}$, then the value of $x^3 - 6^2 + 6x$ is 3 b. 2 c. 1 d. -2

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208. The value of expression $x^4 - 8x^3 + 18x^2 - 8x + 2 when x = 2 + \sqrt{3}$ 2 b. 1 c. 0 d. 3

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209. If $2^{x+1} = 3^{1-x}$ then find the value of x.

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210. Find the values of k for which $\left|\frac{x^2 + kx + 1}{x^2 + x + 1}\right| < 2, \forall x \in R$

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211. Solve the equation $\sqrt{a(2^x - 2) + 1} = 1 - 2^x, x \in R$.

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212. For $a \leq 0,$ jdetermine all real roots of the equation

$x^2 - 2a|x - a| - 3a^2 = 0$

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213. If $ax^2 + bx + c = 0andbx^2 + cx + a = 0$ have a common root and a, b, and c are nonzero real numbers, then find the value of $(a^3 + b^3 + c^3)/abc$

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214. If $x^2 + 3x + 5 = 0andax^2 + bx + c = 0$ have common root/roots and $a, b, c \in N,$ then find the minimum value of `a+b+c

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215. If $\alpha \neq \beta$ but $\alpha^2 = 5\alpha - 3$ and $\beta^2 = 5\beta - 3$ then the equation whose roots are $\frac{\alpha}{\beta}$ and $\frac{\beta}{\alpha}$ is

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216. If α, β are the roots of lthe equation $2x^2 - 3x - 6 = 0,$ find the equation whose roots are $\alpha^2 + 2 and \beta^2 + 2.$

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217. Determine the values of m for which equations $3x^2 + 4mx + 2 = 0 and 2x^2 + 3x - 2 = 0$ may have a common root.

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218. If α, β are the roots of the equation $ax^2 + bx + c = 0$, then find the roots of the equation $ax^2 - bx(x-1) + c(x-1)^2 = 0$ in term of $\alpha and \beta$.

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219. If the difference between the roots of the equation $x^2 + ax + 1 = 0$ is less then $\sqrt{5}$, then the set of possible values of a is

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220. The value of a for which one root of the quadratic equation $(a^2 - 5a + 3)x^2 + (3a - 1)x + 2 = 0$ is twice as large as the other is

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221. If the harmonic mean between roots of $(5+\sqrt{2})x^2 - bx + 8 + 2\sqrt{5} = 0 is 4$, then find the value of b.

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222. Find the values of the parameter a such that the rots α, β of the equation $2x^2 + 6x + a = 0$ satisfy the inequality $\alpha / \beta + \beta / \alpha < 2$.

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223. Let $\alpha and \beta$ be the solutions of the quadratic equation $x^2 - 1154x + 1 = 0$, then the value of $\alpha^{\frac{1}{4}} + \beta^{\frac{1}{4}}$ is equal to _____.

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224. If $a, b, c \in R^+ and 2b = a + c,$ then check the nature of roots of equation $ax^2 + 2bx + c = 0.$

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225. Determine the value of k for which $x+2$ is a factor of $(x+1)^7+(2x+k)^3$.

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226. Given that the expression $2x^3+3px^2-4x+p$ hs a remainder of 5 when divided by $x+2$, find the value of p.

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227. In how many points the graph of $f(x)=x^3+2x^2+3x+4$ meets the x-axis ?

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228. Find the number of real roots of the equation $(x-1)^2+(x-2)^2+(x-3)^2=0.$

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229. Find the values of a for which the roots of the equation $x^2+a^2=8x+6a$ are real.

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230. If $f(x)=x^3+x^2-ax+b$ is divisible by x^2-x , then find the value of a and b

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231. If $f(x)=x^3-3x^2+2x+a$ is divisible by $x-1,$ then find the remainder when $f(x)$ is divided by $x-2.$

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232. Find the value of p for which $x+1$ is a factor of $x^4+(p-3)x^3-(3p-5)x^2+(2p-9)x+6$. Find the remaining factor for this value of p.

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233. If $x+y+z=12 and x^2+y^2+z^2=96 and \frac{1}{x}+\frac{1}{y}+\frac{1}{z}=36$, then the value $x^3+y^3+z^3$ divisible by prime number is______.

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234. If $x^2+ax+10=0$ and $x^2+bx-10=0$ have a common root, then a^2-b^2 is equal to

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235. If the both roots of the equation $x^2 - bx + c = 0$ be two consecutive integers, then $b^2 - 4c$ equals

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236. If $x + y + z = 12 and x^2 + y^2 + z^2 = 96 and \frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 36,$ then the value $x^3 + y^3 + z^3$ divisible by prime number is______.

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237. If the equation $x^2 + bx - a = 0 \text{and} x^2 - ax + b = 0$ have a common root, then a.$a + b = 0$ b. $a = b$ c. $a - b = 1$ d. $a + b = 1$

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238. If $x^3 + 3x^2 - 9x + c$ is of the form $(x - \alpha)^2(x - \beta)$, then c is equal to a.27 b. -27 c. 5 d. -5

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239. If $a and b$ are positive numbers and eah of the equations $x^2 + ax + 2b = 0 and x^2 + 2bx + a = 0$ has real roots, then the smallest possible value of $(a + b)$ is________.

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240. Suppose a, b, c are the roots of the cubic $x^3 - x^2 - 2 = 0$. Then the value of $a^3 + b^3 + c^3$ is _____.

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241. If $ax^2 + (b - c)x + a - b - c = 0$ has unequal real roots for all $c \in R, then$

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242. If a, b, c real in G.P., then the roots of the equation $ax^2 + bx + c = 0$ are in the ratio a. $\frac{1}{2}(-1+\sqrt{3})$ b. $\frac{1}{2}(1-i\sqrt{3})$ $\cdot \frac{1}{2}(-1-i\sqrt{3})$ d. $\frac{1}{2}(1+i\sqrt{3})$

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243. 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 $\frac{q - q'}{p' - p}$.

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244. Given that α, γ are roots of the equation $Ax^2 - 4x + 1 = 0$ and β, δ are roots of the equation $Bx^2 - 6x + 1 = 0$. If α, β, γ and δ are in $H.P.$, then

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245. The graph of the quadratic trinomial $u = ax^2 + bx + c$ has its vertex at (4, -5) and two x-intercepts, one positive and one negative. Which of the following holds good? $a > 0$ b. $b < 0$ c. < 0 d. $8a = b$

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246. The function k$f(x) = ax^3 + bx^2 + cx + d$ has three positive roots. If the sum of the roots of $f(x)$ is 4, the larget possible inegal values of c/a is ___________.

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247. If $(18x^2 + 12x + 4)^n = a_0 + a_{1x} + a2x2 + \; + a_{2n}x^{2n}$, prove that $a_r = 2^n 3^r \left(\hat{} \; (2n)C_r +^n C_1^{2n-2} C_r +^n C_2^{2n-4} C_r + \right)$.

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248. If $(\sin\alpha)x^2 - 2x + b \geq 2$ for all real values of $x \leq 1 and \alpha \in \left(0, \frac{\pi}{2}\right) \cup \left(\frac{\pi}{2}, \pi\right)$, then the possible real values of b is/are 2 (b) 3 (c) 4 (d) 5

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249. If one root $x^2 - x - k = 0$ is square of the other, then $k =$ a. $2 \pm \sqrt{5}$ b. $2 \pm \sqrt{3}$ c. $3 \pm \sqrt{2}$ d. $5 \pm \sqrt{2}$

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250. If $\alpha, and \beta$ be t roots of the equation $x^2 + px - 1/2p^2 = 0, where p \in R.$ Then the minimum value of $\alpha^4 + \beta^4$ is $2\sqrt{2}$ b. $2 - \sqrt{2}$ c. 2 d. $2 + \sqrt{2}$

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251. Find the range of $f(x)=\frac{x^2+34x-71}{x^3+2x-7}$

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252. $x^2-xy+y^2-4x-4y+16=0$ represents a. a point b. a circle c. a pair of straight line d. none of these

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253. If α, β are the nonzero roots of $ax^2+bx+c=0$ and α^2, β^2 are the roots of $a^2x^2+b^2x+c^2=0$, then a, b, c are in (A) G.P. (B) H.P. (C) A.P. (D) none of these

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254. If the roots of the equation $ax^2+bx+c=0$ are of the form $(k+1)/kand(k+2)/(k+1), then(a+b+c)^2$ is equal to (a)$2b^2-ac$

b. $a62$ c. b^2-4ac d. b^2-2ac

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255. If α, β are the roots of $ax^2+bx+c=0 and \alpha+h, \beta+h$ are the roots of $px^2+qx+r=0 then h=$ a.$-\frac{1}{2}\left(\frac{a}{b}-\frac{p}{q}\right)$ b. $\left(\frac{b}{a}-\frac{q}{p}\right)$ c. $\frac{1}{2}\left(\frac{b}{a}-\frac{q}{p}\right)$ d. none of these

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256. The equation $\left(x^2+x+1\right)^2+1=\left(x^2+x+1\right)\left(x^2-x-5\right)$ for $x\in(-2,3)$ will have number of solutions. a.1 b. 2 c. 3 d. 0

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257. If α, β re the roots of $ax^2+c=bx,$ then the equation $(a+cy)^2=b^2y$ in y has the roots a.$\alpha\beta^{-1}, \alpha^{-1}\beta$ b. α^{-2}, β^{-2} c. α^{-1}, β^{-1} d. α^2, β^2

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258. If the roots of the equation $x^2 + 2ax + b = 0$ are real and distinct and they differ by at most $2m$,then b lies in the interval a.$(a^2, a^2 + m^2)$ b. $(a^2 - m^2, a^2)$ c. $[a^2 - m^2, a)$ d. none of these

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259. If the ratio of the roots of $ax^2 + 2bx + c = 0$ is same as the ratios of roots of $px^2 + 2qx + r = 0$, then a.$\frac{2b}{ac} = \frac{q^2}{pr}$ b. $\frac{b}{ac} = \frac{q^{\square}}{pr}$ c. $\frac{b^2}{ac} = \frac{q^2}{pr}$ d. none of these

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260. Show that $\frac{(x+b)(x+c)}{(b-a)(c-a)} + \frac{(x+c)(x+a)}{(c-b)(a-b)} + \frac{(x+a)(x+b)}{(a-c)(b-c)} = 1$ is an identity.

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261. A certain polynomial $P(x)x \in R$ when divided by k $x-a, x-bandx-c$ leaves remainders$a, b, andc$, resepectively. Then find remainder when $P(x)$ is divided by $(x-a)(x-b)(x-c)whereab, c$ are distinct.

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262. If c, d are the roots of the equation $(x-a)(x-b)-k=0$, prove that a, b are roots of the equation $(x-c)(x-d)+k=0.$

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263. If the equation $(a-5)x^2+2(a-10)x+a+10=0$ has roots of opposite sign, then find the value of $a\cdot$

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264. Prove that the roots of the equation $(a^4+b^4)x^2+4abcdx+(c^4+d^4)=0$ cannot be different, if real.

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265. If the roots of the equation $x^2-8x+a^2-6a=0$ are real and distinct, then find all possible value of a.

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266. If roots of equation $x^2+2cx+ab=0$ are real and unequal, then prove that the roots of $x^2-2(a+b)x+a^2+b^2+2c^2=0$ will be imaginary.

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267. If the roots of the equation $a(b-c)x^2+b(c-a)x+c(a-b)=0$ are equal, show that $2/b=1/a+1/c$.

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268. Find the quadratic equation with rational coefficients whose one root is $1/(2+\sqrt{5})$.

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269. 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

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270. If x is real, then $x/(x^2-5x+9)$=y lies between $-1 and -1/11$ b. $1 and -1/11$ c. $1 and 1/11$ d. none of these

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271. Set of all real value of a such that $f(x) = \frac{(2a-1)+x^2+2(a+1)x+(2a-1)}{x^2-2x+40}$ is always negative is a. $-\infty, 0$ b. $0, \infty$ c. $-\infty, 1/2$ d. none

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272. If α and β are the roots of the equation $x^2+2x+8=0$ then the value of $\frac{\alpha}{\beta}+\frac{\beta}{\alpha}$ is ....

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273. If α, β, γ are the roots of the equations $x^3+px^2+qx+r=0$ find the value of $\sum \frac{1}{\alpha}$

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274. Suppose that $f(x)$ isa quadratic expresson positive for all real $x\cdot$ If $g(x)=f(x)+f'(x)+f''(x),$ then for any real $x\left(where f'(x) and f^{x}\right.$ represent 1st and 2nd derivative, respectively). a.$g(x)<0$ b. $g(x)>0$ c. $g(x)=0$ d. $g(x)\geq 0$

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275. If $f\left(x+\frac{1}{2}\right)+f\left(x-\frac{1}{2}\right)=f(x)f$ or $all x\in R,$ then the period of $f(x)$ is 1 (b) 2 (c) 3 (d) 4

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276. If $a, b\in R, a\neq 0$ and the quadratic equation $ax^2-bx+1=0$ has imaginary roots, then $(a+b+1)$ is a. positive b. negative c. zero d. Dependent on the sign of b

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277. If he expression $[mx-1+(1/x)]$ is non-negative for all positive real x, then the minimum value of m must be $-1/2$ b. 0 c. $1/4$ d. $1/2$

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278. $x_1 and x_2$ are the roots of $ax^2+bx+c=0 and x_1x_2<0.$ Roots of $x_1(x-x_2)^2+x_2(x-x_1)^2()=0$ are a. real and of opposite sign b. negative c. positive d. none real

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279. Both the roots of the equation $(x-b)(x-c)+(x-a)(x-c)+(x-a)(x-b)=0$ are always a. positive b. real c. negative d. none of these

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280. Let a, b and be the roots of the equation $x^2 - 10xc - 11d = 0$ and those roots of c and d of $x^2 - 10ax - 11b = 0, \cdot$ then find the value of \`a+b+c+d

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281. Fill in the blanks The coefficient of x^{99} in the polynomial $(x-1)(x-2)(x-3)\ldots.(x-100) is\_ \_\_ \_ \cdot$

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282. Fill in the blanks If $2 + i\sqrt{3}$ is a root of the equation $x^2 + px + q = 0, where p and q$ are real, then $(p, q) = (\_\_ \_\_, \_ \_\_).$

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283. If the products of the rots of the equation $x^2 - 3kx + 2e^{2\log k} - 1 = 0$ is 7, then the roots are real for $k = \ldots.$

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284. For $a \neq b$, if the equation $x^2 + ax + b = 0$ and $x^2 + bx + a = 0$ have a common root, then the value of a+b=

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285. Fill in the blanks If $x < 0, y < 0, x + y + (x/y) = (1/2) and (x + y)(x/y) = -(1/2), thenx$ and $y = \_\_\_\_\_\_\_\_.$

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286. If $f(x) = ax^2 bx + c, g(x) = -ax^2 + bx + c$ where ac $\neq 0$, then prove that f(x)g(x) = 0 has at least two real roots

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287. If l, m, n are real $l \neq m$, then the roots of the equation $(l - m)x^2 - 5(l_+ m)x - 2(l - m) = 0$ are a. real and equal b. Complex c. real and unequal d. none of these

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288. If $x, y, andz$ are real and different and $u = x^2 + 4y^2 + 9z^2 - 6yz - 3zx - 2xy, the\nu$ is always a. non-negative b. zero c. non-positive d. none of these

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289. Let $a > 0, b > 0$ and $c > 0$. Then, both the roots of the equation $ax^2 + bx + c = 0$ are a. real and negative b.have negative real parts c. have positive real parts d. None of the above

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290. Let a is a real number satisfying $a^3 + \frac{1}{a^3} = 18$. Then the value of $a^4 + \frac{1}{a^4} - 39$ is ____.

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291. If $ax^2 + bx + c = 0, a, b, c \in R$ has no real zeros, and if a + b + c + $<$ 0, then

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292. If $f(x) = \sqrt{x^2 + ax + 4}$ is defined for all x, then find the values of a.

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293. Find the domain and range of $f(x) = \sqrt{x^2 - 4x + 6}$

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294. Find the range of the function $f(x) = 6^x + 3^x + 6^{-x} + e^{-x} + 2.$

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295. If α, β are the roots of the equation $2x^2 + 2(a + b)x + a^2 + b^2 = 0$ then find the equation whose roots are $(\alpha + \beta)^2$ and $(\alpha - \beta)^2$

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296. Let $a, b, and c$ be distinct nonzero real numbers such that $\frac{1-a^3}{a} = \frac{1-b^3}{b} = \frac{1-c^3}{.}$ The value of $\left(a^3 + b3 + c^3\right)$ is ____________.

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297. Find the range of $f(x) = x^2 - x - 3.$

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298. The function k$f(x) = ax^3 + bx^2 + cx + d$ has three positive roots. If the sum of the roots of $f(x)$ is 4, the larget possible inegal values of c/a is ____________.

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299. If the quadratic equation $ax^2 + bx + c = 0(a > 0)$ has $\sec^2 \theta and \cos ec^2\theta$ as its roots, then which of the following must hold good? (a.) $b+c=0$ (b.) $b^2-4ac\geq 0$ (c.) c $\geq 4a$ (d.) $4a+b\geq 0$

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300. Let $x, y, z\in R$ such that $x+y+z=6 and xy+yz+zx=7.$

Then find the range of values of $x, y, and z.$

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301. if $ax^2+bx+c=0$ has imaginary roots and $a+c<b$ then prove that $4a+c<2b$

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302. Let $a, b, and c$ be distinct nonzero real numbers such that $\frac{1-a^3}{a}=\frac{1-b^3}{b}=\frac{1-c^3}{c}.$ The value of $\left(a^3+b^3+c^3\right)$ is ____________.

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303. If $x^2 - 6x + k = 0$ has equal roots the value of k is

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304. If the quadratic equation $4x^2 - 2(a + c - 1)x + ac - b = 0(a > b > c)$ (a)Both roots se greater than a (b)Both roots are less than c (c)Both roots lie between $\frac{c}{2}$ and $\frac{a}{2}$ (d)Exactly one of the roots lies between $\frac{c}{2}$ and $\frac{a}{2}$

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305. If the equation $x^2 = ax + b = 0$ has distinct real roots and $x^2 + a|x| + b = 0$ has only one real root, then which of the following is true? $b = 0, a > 0$ b. $b = 0, a < 0$ c. $b > 0, a < 0$ d. $b\langle 0, a\rangle 0$

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306. If the equation $\left|x^2+bx+c\right|=k$ has four real roots, then

A. $b^2-4c>0 \text{ and } 0<k<\dfrac{4c-b^2}{4}$

B. $b^2-4c<0 \text{ and } 0<k<\dfrac{4c-b^2}{4}$

C. $b^2-4c>0 \text{ and } k>\dfrac{4c-b^2}{4}$

D. none of these

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307. If $\left(b^2-4ac\right)^2\left(1+4a^2\right)<64a^2, a<0$, then maximum value of quadratic expression ax^2+bx+c is always less than a. 0 b. 2 c. -1 d. -2

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308. For $x^2-(a+3)|x|+4=0$ to have real solutions, the range of a is $(-\infty, -7] \cup [1, \infty)$ b. $(-3, \infty)$ c. $(-\infty, -7)$ d. $[1, \infty)$

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309. The number of integral value of x satistying $\sqrt{x^2 + 10x - 16} < x - 2$ is

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310. If $x^2 + ax - 3x - (a + 2) = 0$ has real and distinct roots, then minimum value of $(a^2 + 1) / (a^2 + 2)$ is

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311. Let $\alpha + i\beta; \alpha, \beta \in R,$ be a root of the equation $x^3 + qx + r = 0; q, r \in R$. A real cubic equation, independent of $\alpha \& \beta$, whose one root is 2α is (a) $x^3 + qx - r = 0$ (b) $x^3 - qx + r = 0$ $x^3 + 2qx + r = 0$ (d) None of these

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312. If α, β, γ are the roots of the equations $x^3 + px^2 + qx + r = 0$ find the value of $\sum \frac{1}{\alpha\beta}$

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313. The equations $x^2 - 4x + a = 0$ and $x^2 + bx + 5 = 0$have one root in common The other root of these equations are integers in the ratio 3 : 5Find the common root

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314. If $\alpha, \beta, \gamma, \sigma$ are the roots of the equation $x^4 + 4x^3 - 6x^2 + 7x - 9 = 0,$ then he value of $(1 + \alpha^2)(1 + \beta^2)(1 + \gamma^2)(1 + \sigma^2)$ is a.9 b. 11 c. 13 d. 5

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315. If the roots of the equation $q^2x^2 + p^2x + r^2 = 0$ are the squares of the roots of the equation $qx^2 + px + r = 0$, then p,q,r are in ....

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316. If a, b, p, q are nonzero real numbers, then how many comman roots would two equations $2a^2x^2 - 2abx + b^2 = 0 and p^2x^2 + 2pqx + q^2 = 0$ have?

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317. If the equation $x^2 - 3px + 2q = 0 and x^2 - 3ax + 2b = 0$ have a common roots and the other roots of the second equation is the reciprocal of the other roots of the first, then $(2 - 2b)^2$. $36pa(q - b)^2$ b. $18pa(q - b)^2$ c. $36bq(p - a)^2$ d. $18bq(p - a)^2$

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318. a, b, c are positive numbers in $G.P.$ and the equation $(a+di)x^2+2(b+ei)x+(c+\quad \text{if}\quad)=0$ have no real root. Then $\frac{a}{d}$, $\frac{b}{e}, \frac{c}{f}$ are in $(a, b, c, d, e, f \in R)$

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319. If equations $x^2+ax+12=0. x^2+bx+15=0 and x^2+(a+b)x+36=0,$ have a common positive root, then find the values of $a and b$.

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320. If the roots of the equation $x^2+2bx+c=0$ are α and β, then $b^2-c=$

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321. Solve $x^2-x+2=0$

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322. Find the value of $2+\frac{1}{2+\frac{1}{2+\frac{1}{2+\infty}}}$

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323. If both the roots of $ax^2+ax+1=0$ are less than 1, then find the exhaustive range of values of $a\cdot$

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324. If both the roots of $x^2+ax+2=0$ lies in the interval (0, 3), then find the exhaustive range of value of $a\cdot$

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325. Solve $\frac{x^2+3x+2}{x^2-6x-7}=0.$

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326. Solve $\sqrt{x-2}+\sqrt{4-x}=2$.

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327. Solve the equation $x(x+2)\left(x^2-1\right)=-1$.

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328. Prove that graphs of $y=x^2+2andy=3x-4$ never intersect.

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329. In how many points the line $y+14=0$ cuts the curve whose equation is $-x\left(x^2+x+1\right)=0$?

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330. If $x^2 + px - 444p = 0$ has integral roots where p is prime number, then find the value $(s) of p$.

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331. The equation $ax^2 + bx + c = 0$ has real and positive roots. Prove that the roots of the equation $a^2x^2 + a(3b - 2c)x + (2b - c)(b - c) + ac = 0$ re real and positive.

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332. Show that the minimum value of $(x + a)(x + b)/(x + c)\dot{w}herea > c, b > c,$ is $\left(\sqrt{a - c} + \sqrt{b - c}\right)^2$ for real values of $x > -c$

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333. Let a, b $\in$ N and a gt 1 . Also p is a prime number . If $ax^2 + bx + c = p$ for two distinct integral values of x, then prove that $ax^2 + bx + c \neq$ 2p for any integral value of x .

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334. If $2x^2 - 3xy - 2y^2 = 7$, then prove that there will be only two integral pairs (x, y) satisfying the above relation.

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335. If x is real, then the maximum value of $y = 2(a - x)\left(x + \sqrt{x^2 + b^2}\right)$

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336. If equation $x^4 - (3m + 2)x^2 + m^2 = 0 (m > 0)$ has four real solutions which are in A.P., then the value of m is_____.

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337. Number of positive integers x for which $f(x) = x^3 - 8x^2 + 20x - 13$ is a prime number is_____.

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338. If set of values a for which $f(x) = ax^2 - (3 + 2a)x + 6, a \neq 0$ is positive for exactly three distinct negative integral values of x is $(c, d]$, then the value of $(c^2 + 4|d|)$ is equal to ______.

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339. Polynomial $P(x)$ contains only terms of aodd degree. when $P(x)$ is divided by $(x - 3)$, the ramainder is 6. If $P(x)$ is divided by $(x^2 - 9)$ then remainder is $g(x)$. Then find the value of $g(2)$.

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340. If the equation $2x^2 + 4xy + 7y^2 - 12x - 2y + t = 0, where t$ is a parameter has exactly one real solution of hte form (x, y) , then hte sum of $(x + y)$ is equal to _____.

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341. Let α_1, β_1 be the roots $x^2 - 6x + p = 0 and$ α_2, β_2 be the roots $x^2 - 54x + q = 0$. If $\alpha_1, \beta_1, \alpha_2, \beta_2$ form an increasing G.P., then sum of the digits of the value of $(q - p)$ is _________.

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342. If $\sqrt{\sqrt{\sqrt{x}}} = (((x^4 + 4)$^(1/4))^(1/4)) ^(1/4) $thenthevalueof$x^4` is____.

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343. Let $P(x) = x^4 + ax^3 + bx^2 + cx + d$ be a polynomial such that $P(1) = 1, P(2) = 8, + P(3) = 27, P(4) = 64$ then the value of $152 - P(5)$ is__________.

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344. If the equation $x^2 + 2(\lambda + 1)x + \lambda^2 + \lambda + 7 = 0$ has only negative roots, then the least value of λ equals________.

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345. If α and β are the roots of the quadratic equation $4x^2 + 3x + 7 = 0$, then the value of $\frac{1}{\alpha} + \frac{1}{\beta} =$

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346. If $(x^2 + ax + 3)/(x^2 + x + a)$ takes all real values for possible real values of x, then a.$4a^2 + 39 < 0$ b. $4a^5 + 39 \succ 0$ c. $a \geq \frac{1}{4}$ d. $a < \frac{1}{4}$

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347. If $\cos^4\theta + \alpha$ and $\sin^4\theta + \alpha$ are the roots of the equation $x^2 + 2bx + b = 0 and \cos^2\theta + \beta, \sin^2\theta + \beta are$ the roots of the equation $x^2 + 4x + 2 = 0,$ then values of b are 2 b. -1 c. -2 d. 1

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348. If the roots of the equation $x^2 + px + c = 0$ are 2,-2 and the roots of the equation $x^2 + bx + q = 0$ are -1,-2, then the roots of the equation $x^2 + bx + c = 0$ are

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349. If $a, b, c \in R^{+} and 2b = a + c,$ then check the nature of roots of equation $ax^2 + 2bx + c = 0.$

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350. Let $f(x) = x^2 + bx + c, where b, c \in R.$ If $f(x)$ is a factor of both $x^4 + 6x^2 + 25 and 3x^4 + 4x^4 + 28x + 5$, then the least value of $f(x)$ is 2 b. 3 c. $5/2$ d. 4

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351. Let $f(x) = ax^2 + bx + c. Consider the follow \in g diagram. Then Fig$c<0b >0a+b-c >0a b c<0`

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352. If the roots of the equation $x^2 + 2bx + c = 0$ are α and β, then $b^2 - c =$

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353. The equation $\left(\frac{x}{x+1}\right)^2 + \left(\frac{x}{x-1}\right)^2 = a(a-1)$ has a. Four real roots if $a > 2$ b.Four real roots if $a < -1$ c Two real roots if a>2 d. none of these

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354. Find the complete set of values of a such that $(x^2 - x)/(1 - ax)$ attains all real values.

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355. If α, β are roots of $x^2 + px + 1 = 0 and \gamma, \delta$ are the roots of $x^2 + qx + 1 = 0$, then prove that $q^2 - p^2 = (\alpha - \gamma)(\beta - \gamma)(\alpha + \delta)(\beta + \delta)$.

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356. If $\alpha and \beta$ are the roots of $x^2 - a(x+1) - b = 0$ then find the value of $1/(\alpha^2 - a\alpha) + 1/(\beta^2 - a\beta) - 2/a + b$.

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357. Difference between the corresponding roots of $x^2 + ax + b = 0$ and $x^2 + bx + a = 0$ is same and $a \neq b$, then

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358. If the sum of the roots of an equation is 2 and the sum of their cubes is 98, then find the equation.

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359. Find the range of $f(x) = \sqrt{x - 1} + \sqrt{5 - x.}$

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360. If $x^2 + ax + bc = 0 and x^2 + bx + ca = 0 (a \neq b)$ have a common root, then prove that their other roots satisfy the equation $x^2 + cx + ab = 0.$

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361. Let α, β are the roots of $x^2 + bx + 1 = 0.$ Then find the equation whose roots are -$(\alpha + 1/\beta)$ and $-(\beta + 1/\alpha)$.

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362. If $a, b, c \in R$ such that $a + b + c = 0 and a \neq c$, then prove that the roots of $(b + c - a)x^2 + (c + a - b)x + (a + b - c) = 0$ are real and distinct.

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363. Evaluate: $i^{135} \left(-\sqrt{-1}\right)^{4n+3}, n \in N \sqrt{-25} + 3\sqrt{-4} + 2\sqrt{-9}$

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364. If the equation $(a - 5)x^2 + 2(a - 10)x + a + 10 = 0$ has roots of opposite sign, then find the value of a.

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365. If $\alpha and \beta$ are the roots of $ax^2 + bx + c = 0 and S_n = \alpha^n + \beta^n$, then $aS_{n+1} + bS_n + cS_{n-1} = 0$

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366. If both the roots of $x^2 - ax + a = 0$ are greater than 2, then find the value of a.

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367. If $(y^2 - 5y + 3)(x^2 + x + 1) < 2x$ for all $x \in R$, then find the interval in which y lies.

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368. The values of 'a' for which $4^x - (a-4)2^x + \frac{9a}{4} < 0 \forall x \in (1, 2)$ is

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369. Find the number of positive integral values of k for which $kx^2 + (k-3)x + 1 < 0$ for atleast one positive x.

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370. If $x^2 + 2ax + a < 0 \forall x \in [1, 2]$ then find set of all possible values of a

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371. Given that a, b, c are distinct real numbers such that expressions $ax^2 + bx + c, bx^2 + cx + aandcx^2 + ax + b$ are always non-negative. Prove that the quantity $(a^2 + b^2 + c^2)/(ab + bc + ca)$ can never lie inn $(-\infty, 1) \cup [4, \infty)$.

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372. Find the number of quadratic equations, which are unchanged by squaring their roots.

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373. Solve : $\sqrt{x^2-16}-\sqrt{x^2-8x+16}=\sqrt{x^2-5x+4}$

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374. Show that the equation $A^2/(x-a)+B^2/(x-b)+C^2/(x-c)+\ldots+H^2/(x-h)=k$ has no imaginary root, where $A, B, C, \ldots., Handa, b, c, \ldots\ldots., handk \in R.$

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375. Find the values of a if $x^2-2(a-1)x+(2a+1)=0$ has positive roots.

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376. If α and β, α and γ and α and δ are the roots of the equations

$ax^2 + 2bx + c = 0, 2bx^2 + cx + a = 0$ and $cx^2 + ax + 2b = 0$

respectively, where a,b and c are positive real numbers, then $\alpha + \alpha^2 =$

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377. If the roots of the equation $ax^2 - bx + c = 0 are \alpha, \beta,$ then the roots of the equation $b^2cx^2 - ab^2x + a^3 = 0$ are $\frac{1}{\alpha^3 + \alpha\beta}, \frac{1}{\beta^3 + \alpha\beta}$ b. $\frac{1}{\alpha^2 + \alpha\beta}, \frac{1}{\beta^2 + \alpha\beta}$ c. $\frac{1}{\alpha^4 + \alpha\beta}, \frac{1}{\beta^4 + \alpha\beta}$ d. none of these

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378. If the ratio of the roots of $ax62 + 2bx + c = 0$ is same as the ratios of roots of $px^2 + 2qx + r = 0,$ then $\frac{2b}{ac} = \frac{q^2}{pr}$ b. $\frac{b}{ac} = \frac{q^\square}{pr}$ c.

$\frac{b^2}{ac} = \frac{q^2}{pr}$ d. none of these

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379. Find the projection vector of $\vec{b} = \hat{i} + 2\hat{j} + \hat{k}$ along the vector $\vec{a} = 2\hat{i} + \hat{j} + 2\hat{k}$.

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380. Suppose A, B, C are defined as $A = a^2b + ab^2 - a^2c - ac^2, B = b^2c + bc^2 - a^2b - ab^2$, and $C = a^2c + ac^2 - b^2c - bc^2, where a > b > c > 0$ and the equation $Ax^2 + Bx + C = 0$ has equal roots, then a, b, c are in $A\dot{P}\cdot$ b. $G\dot{P}\cdot$ c. $H\dot{P}\cdot$ d. $A\dot{G}\dot{P}\cdot$

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381. The integral value of m for which the root of the equation $mx^2 + (2m-1)x + (m-2) = 0$ are rational are given by the expression [where n is integer]

(A)n^2

(B) $n(n+2)$

(C) $n(n+1)$

(D) none of these

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382. If $a, b, c, d \in R$, then the equation $(x^2 + ax - 3b)(x^2 - cx + b)(x^2 - dx + 2b) = 0$ has a. 6 real roots b. at least 2 real roots c. 4 real roots d. none of these

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383. For $x^2 - (a+3)|x| + 4 = 0$ to have real solutions, the range of a is $(-\infty, -7] \cup [1, \infty)$ b. $(-3, \infty)$ c. $(-\infty, -7)$ d. $[1, \infty)$

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384. If $\alpha and \beta$ are roots of the equation $ax^2 + bx + c = 0$, then the roots of the equation $a(2x+1)^2 - b(2x+1)(x-3) + c(x-3)^2 = 0$ are a. $\frac{2\alpha+1}{\alpha-3}, \frac{2\beta+1}{\beta-3}$ b. $\frac{3\alpha+1}{\alpha-2}, \frac{3\beta+1}{\beta-2}$ c. $\frac{2\alpha-1}{\alpha-2}, \frac{2\beta+1}{\beta-2}$ d. none of these

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385. If $a, b, c, d \in R$, then the equation $(x^2 + ax - 3b)(x^2 - cx + b)(x^2 - dx + 2b) = 0$ has a. 6 real roots b. at least 2 real roots c. 4 real roots d. none of these

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386. In how many points graph of $y = x^3 - 3x2 + 5x - 3$ interest the x-axis?

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387. The quadratic polynomial $p(x)$ ha following properties $p(x)$ can be positive or zero for all real numbers $p(1) = 0 and p(2) = 2.$ Then find the quadratic polynomial.

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388. If $(1 - p)$ is a root of quadratic equation $x^2 + px + (1 - p) = 0$ then its roots are

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389. A polynomial in x of degree 3 vanishes when $x = 1$ and $x = -2$, ad has the values 4 and 28 when $x = -1$ and $x = 2$, respectively. Then find the value of polynomial when $x = 0$.

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390. Let $f(x) = a^2 + bx + c$ where a ,b , c in $Randa \neq 0$. It is known that $f(5) = -3f(2)$ and that 3 is a root of $f(x) = 0$. then find the other of $f(x) = 0$.

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391. If $x = 1andx = 2$ are solutions of equations $x^3 + ax^2 + bx + c = 0anda + b = 1$, then find the value of b.

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392. If $x \in R, anda, b, c$ are in ascending or descending order of magnitude, show that $(x - a)(x - c) / (x - b)(wherex \neq b)$ can assume any real value.

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393. Prove that graphs $y = 2x - 3andy = x^2 - x$ never interest.

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394. Which of the following pair of graphs intersect?

$y = x^2 - xandy = 1$ $y = x^2 - 2x + 3$ and $y = \sin x$

$y = x^2 - x + 1andy = x - 4$

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395. If $\alpha and \beta$ are the rootsof he equations $x^2 - ax + b = 0andA_n = \alpha^n + \beta^n$, then which of the following is true?

a.$A_{n+1} = aA_n + bA_{n-1}$ b. $A_{n+1} = bA_{n-1} + aA_n$ c. $A_{n+1} = aA_n - bA_{n-1}$ d. $A_{n+1} = bA_{n-1} - aA_n$

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396. If α, β are the roots of $x^2 + px + q = 0 and \gamma, \delta$ are the roots of $x^2 + px + r = 0$, then $\frac{(\alpha - \gamma)(\alpha - \delta)}{(\beta - \gamma)(\beta - \delta)} =$ a.1 b. q c. r d. $q + r$

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397. If the equations $ax^2 + bx + c = 0 and x^3 + 3x^2 + 3x + 2 = 0$ have two common roots, then a.$a = b = c$ b. $a = b \neq c$ c. $a = -b = c$ d. none of these

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398. The value m for which one of the roots of $x^2 - 3x + 2m = 0$ is double of one of the roots of $x^2 - x + m = 0$ is -2 b. 1 c. 2 d. none of these

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399. Let $p(x) = 0$ be a polynomial equation of the least possible degree, with rational coefficients having $\sqrt[3]{7} + \sqrt[3]{49}$ as one of its roots. Then product of all the roots of $p(x) = 0$ is a.56 b. 63 c. 7 d. 49

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400. The number of values of a for which equations $x^3 + ax + 1 = 0 and x^4 + ax^2 + 1 = 0$ have a common root is a. 0 b. 1 c. 2 d. Infinite

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401. The equation $x^2 + y^2 + 2gx + 2fy + c = 0$ reprsents the circle if

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402. If $\alpha, \beta, \gamma, \delta$ are the roots of the equation $x^4 + 4x^3 - 6x^2 + 7x - 9 = 0,$ then he value of $(1 + \alpha^2)(1 + \beta^2)(1 + \gamma^2)(1 + \sigma^2)$ is a.9 b. 11 c. 13 d. 5

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403. If α, β are the roots of $ax^2 + bx + c = 0, (a \neq 0)$ and $\alpha + \delta, \beta + \delta$ are the roots of $Ax^2 + Bx + C = 0, (A \neq 0)$ for some constant δ then prove that $\frac{b^2 - 4ac}{a^2} = \frac{B^2 - 4AC}{A^2}$

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404. Let $f(x) = Ax^2 + Bx + c, where A, B, C$ are real numbers. Prove that if $f(x)$ is an integer whenever x is an integer, then the numbers $2A, A + B, and C$ are all integer. Conversely, prove that if the number $2A, A + B, and C$ are all integers, then $f(x)$ is an integer whenever x is integer.

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405. Let S be a square of nit area. Consider any quadrilateral, which has none vertex on each side of S. If $a, b, candd$ denote the lengths of the sides of het quadrilateral, prove that $2 \leq a^2 + b^2 + c^2 + x^2 \leq 4.$

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406. For $a \leq 0,$ jdetermine all real roots of the equation

$x^2 - 2a|x - a| - 3a^2 = 0$

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