MATHS

BOOKS - ARIHANT MATHS (HINGLISH)

THEORY OF EQUATIONS

Examples

1. यदि समीकरण $(\lambda^2 - 5\lambda + 6)x^2 + (\lambda^2 - 3\lambda + 2)x + (\lambda^2 - 4) = 0;\ \ x,$ के दो से अधिक मानो के लिए संतुष्ट होता है, तब $\lambda =$

A. 2

B. -2

C. $2\ \&\ 3$

D. 3

Answer: A

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2. 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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3. Show that $x^2-3|x|+2=0$ is an equation.

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4. Solve the equation $\frac{x}{2}+\frac{(3x-1)}{6}=1-\frac{x}{2}$

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5. Solve the equation $(a-3)x+5=a+2$.

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6. Find all values of the parameter a for which the quadratic equation

$(a+1)x^2 + 2(a+1)x + a - 2 = 0$

(i) has two distinct roots.

(ii) has no roots.

(iii) has to equal roots.

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

(1985,5M)

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8. Show that if p, q, r and s are real numbers and $pr = 2(q+s)$, then atleast one of the equations $x^2 + px + q = 0$ and $x^2 = rx + s = 0$ has real roots.

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9. 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 a, b (d) $a+c, b+c$

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10. Find all roots of the equation $x^4+2x^3-16x^2-22x+7=0$, if one root is $2+\sqrt{3}$

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11. If one root of the equation $x^2-ix-(1+i)=0, \left(i=\sqrt{-1}\right)$ is $1+i$, find the other root.

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12. If one roots of the equation $x^2 - \sqrt{5}x - 19 = 0$ is $\frac{9+\sqrt{5}}{2}$ then find the other root.

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13. If the difference between the corresponding roots of the equations $x^2 + ax + b = 0$ and $x^2 + bx + a = 0(a1 = b)$ si the same, find the value of $a + b$.

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14. If $a + b + c = 0$ and a, b, c are ratiional. Prove that the roots of the equation

$(b + c - a)x^2 + (c + a - b)x + (a + b - c) = 0$ are rational.

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15. If the roots of the equation $(b-c)x^2+(c-a)x+(a-b)=0$ are equal then a, b, c will be in

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16. If α is a root of the equation $x^2+2x-1=0$, then prove that $4\alpha^2-3\alpha$ is the other root.

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17. If α, β are the roots fo the equation $\lambda\left(x^2-x\right)+x+5=0$. If λ_1 and λ_2 are two values of λ for which the roots α, β are related by $\frac{\alpha}{\beta}+\frac{\beta}{\alpha}=\frac{4}{5}$ find the value of $\frac{\lambda_1}{\lambda_2}+\frac{\lambda_2}{\lambda_1}$

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18. If α, β are roots of $x^2 - px + q = 0$ then find the quadratic equation whose roots are $\left(\left(\alpha^2 - \beta^2\right)\left(\alpha^3 - \beta^3\right)\right)$ and $\alpha^2\beta^3 + \alpha^3\beta^2$

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19. If α, β be the roots of the equation $x^2 - px + q = 0$ then find the equation whose roots are $\frac{q}{p - \alpha}$ and $\frac{q}{p - \beta}$

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

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21. If α, β be the roots of the equation $3x^2 + 2x + 1 = 0$, then find value of $\left(\frac{1-\alpha}{1+\alpha}\right)^3 + \left(\frac{1-\beta}{1+\beta}\right)^3$

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22. Let $x^2 - (m-3)x + m = 0 (m \varepsilon R)$ be a quadratic equation . Find the values of m for which the roots are (i) real and distinct (ii) equal (iii) not real (iv) opposite in sign (v) equal in magnitude but opposite in sign (vi) positive (vii)negative (viii) such that atleast one is positive

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23. Find the value of λ so that the equations $x^2 - x - 12 = 0$ and $\lambda x^2 + 10x + 3 = 0$ may have one root in common. Also, find the common root.

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24. If equations $ax^2 - bx + c = 0$ (where $a, b, c \varepsilon R$ and $a \neq 0$) and $x^2 + 2x + 3 = 0$ have a common root, then show that $a : b : c = 1 : 2 : 3$

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25. If a, b, c are in GP, then the equations $ax^2 + 2bx + c = 0$ and $dx^2 + 2ex + f = 0$ have a common root if $\frac{d}{a}, \frac{e}{b}, \frac{f}{c}$ are in

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26. Solve the inequality $(x+3)(3x-2)^5(7-x)^3(5x+8)^2 \geq 0$.

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27. Solve the inequality

$$\frac{\left((x-2)^{10000}(x+1)^{235}\left(x-\frac{1}{2}\right)^{971}(x+8)\right)^4}{x^{500}(x-3)^{75}(x+2)^{93}} \geq 0$$

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28. Let $f(x)=\frac{(x-3)(x+2)(x+6)}{(x+1)(x-5)}$ Find intervals where $f(x)$ is positive or negative

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29. Find the set of all x for which (1987, 3M) $\frac{2x}{2x^2+5x+2}>\frac{1}{x+1}$

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

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31. The number of integral values of K' the inequality $\left|\frac{x^2+kx+1}{x^2+x+1}\right|<3$ is satisfied for all real values of x is....

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32. Find the value of m for which the expressiion $12x^2 - 10xy + 2y^2 + 11x - 5y + m$ can be resolved into two rational linear factors.

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33. $ax^2 + by^2 + cz^2 + 2ayz + 2bzx + 2cxy$ can be resolved into linear factors if a, b, c are such that

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34. Find the linear factors of $x^2 - 5xy + 4y^2 + x + 2y - 2$

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35. Find the values of m for which roots of equation $x^2 - mx + 1 = 0$ are less than unity.

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36. For what values of $m \varepsilon R$, both roots of the equation $x^2 - 6mx + 9m^2 - 2m + 2 = 0$ exceed 3?

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37. All possible values of a, so that 6 lies between the roots of the equation $x^2 + 2(a - 3)x + 9 = 0$

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38. Find the valuesof m for which exactly one root of the equation $x^2 - 2mx + m^2 - 1 = 0$ lies in the interval $(-2, 4)$

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39. $4x^2 - 2x + a = 0$, has two roots lies in$(-1, 1)$ then ?

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40. Find the values of a for which one root of equation $(a-5)x^2 - 2ax + a - 4 = 0$ is smaller than 1 and the other greater than 2.

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41. Let $x^2 - (m-3)x + m = 0 (m \varepsilon R)$ be a quadratic equation . Find the values of m for which the roots are (ix)one root is smaller than 2 & other root is greater than 2 (x) both the roots are greater than 2 (xi) both the roots are smaller than 2 (xii)exactly one root lies in the interval (1;2) (xiii) both the roots lies in the interval (1;2) (xiv) atleast one root lies in

the interval (1;2) (xv) one root is greater than 2 and the other root is smaller than 1

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42. Find the conditions if roots of the equation $x^3 - px^2 + qx - r = 0$ are in

(i) AP (ii)GP

(iii) HP

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43. Solve $6x^3 - 11x^2 + 6x - 1 = 0$, roots of the equatioin are in HP.

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44. If α, β, γ are the roots of the equatiion $x^3 - px^2 + qx - r = 0$ find

(i) $\sum alppha^2$ (ii) $\sum \alpha^2\beta$ (iii) $\sum \alpha^3$

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45. If α, β, γ are the roots of the cubic equation $x^3 + qx + r = 0$ then the find equation whose roots are $(\alpha - \beta)^2, (\beta - \gamma)^2, (\gamma - \alpha)^2$.

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46. 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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47. If $x^2 + ax + 1 = 0$ is a factor of $ax^3 + bx + c$, then which of the following conditions are not valid

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48. A certain polynomial $P(x)x \in R$ when divided by k $x-a, x-b and x-c$ leaves remainders$a, b, and c$, resepectively. Then find remainder when $P(x)$ is divided by $(x-a)(x-b)(x-c) where ab, c$ are distinct.

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49. 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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50. If $a < b < c < d$ then show that $(x-a)(x-c)+3(x-b)(x-d)=0$ has real and distinct roots.

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51. If 2a+3b+6c = 0, then show that the equation $ax^2+bx+c=0$ has atleast one real root between 0 to 1.

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52. Solve for x: $2x^4+x^3-11x^2+x+2=0$

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53. Solve the equation $(12x-1)(6x-1)(4x-1)(3x-1)=5$

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

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55. The equation $(6-x)^4+(8-x)^4=16$ has

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56. Find the values of 'a' for which $-3<\frac{x^2+ax-2}{x^2+x+1}<2$ is valid for all real x.

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57. Solve the equation $x^2-5|x|+6=0$

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58. Solve: $\left|\frac{x^2-8x+12}{x^2-10x+21}\right|=\frac{-(x^2-8x+12)}{x^2-10x+21}$

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59. Solve the equatioin $|x - |4 - x| \,|\, - 2x = 4$

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60. Solve the equation $\left|\frac{x}{x-1}\right| + |x| = \frac{x^2}{|x-1|}$

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61. Solv ethe equation $|x-1| + |7-x| + 2|x-2| = 4$

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62. Solve the inequation $\left|1 - \left(\frac{|x|}{1+|x|}\right)\right| \geq \frac{1}{2}$

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63. $\left[\frac{1}{4}\right]+\left[\frac{1}{4}+\frac{1}{200}\right]+\left[\frac{1}{4}+\frac{1}{100}\right]+\ldots.\left[\frac{1}{4}+\frac{199}{200}\right]$ is

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64. Let $[a]$ denotes the larger integer not exceeding the real number a if x and y satisfy the equations $y=2[x]+3$ and $y=3[x-2[$ simultaneously determine $[x+y]$

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65. If $[x]$ and (x) are the integral part of x and nearest integer to x then solve $(x)[x]=1$

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66. The solution set of x which satisfies the equation $x^2+(x+1)^2=25$ where (x) is a least integer greater than or equal to x

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67. If $\{x\}$ and $[x]$ represent fractional and integral part of x respectively, find the value of $[x] + \sum_{r=1}^{2000} \frac{\{x+r\}}{2000}$

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68. If $\{x\}$ and $[x]$ represent fractiona and integral part of x respectively then solve the equation $x - 1 = (x - [x])(x - \{x\})$

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69. If f(x) and [x] denote respectively the fractional and integeral parts of a real number x, then the number of solution of the euation 4{x}=x+[x] , is

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70. Let $\{x\}$ and $[x]$ denotes the fraction fractional and integral part of a real number (x), respectively. Solve $|2x - 1 + \ = 3[x] + 2[x]$.

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71. The equation $(x)^2 = [x]^2 + 2x$ where $[x]$ and (x) are the integers just less than or equal to x and just greater than or equal to x respectively, then number of values of x satisfying the given equation

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72. Solve the system of equations in x, y and z satisfying the following equations

$x + [y] + \{z\} = 3.1, y + [z] + \{x\} = 4.3$ and $z + [x] + \{y\} = 5.4$

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73. Solve the equation $x^3 - [x] = 3$, where $[x]$ denotes the greatest integer less than or equal to x.

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74. Solve the equation $x^3 - 3x - a = 0$ for different values of a

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75. Show that the equation $x^3 + 2x^2 + x + 5 = 0$ has only one real root, such that $[\alpha] = -3$, where $[x]$ denotes the integral point of x

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76. Find the values of a for which all the roots of the euation $x^4 - 4x^3 - 8x^2 + a = 0$ are real.

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77. Let $-1 \leq p \leq 1$. Show that the equation $4x^3 - 3x - p = 0$ has a unique root in the interval [1/2,1] and identify it.

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78. Prove that the following equations has no solutions.

(i) $\sqrt{(2x+7)} + \sqrt{(x+4)} = 0$ (ii) $\sqrt{(x-4)} = -5$

(iii) $\sqrt{(6-x)} - \sqrt{(x-8)} = 2$ (iv) $\sqrt{-2-x} = \sqrt[5]{(x-7)}$

(v) $\sqrt{x} + \sqrt{(x+16)} = 3$ (vi) $7\sqrt{x} + 8\sqrt{-x} + \frac{15}{x^3} = 98$

(vii) $\sqrt{(x-3)} - \sqrt{x+9} = \sqrt{(x-1)}$

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79. Solve the equation $\sqrt{x} = x - 2$

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80. Solve the equation $3\sqrt{(x+3)} - \sqrt{(x-2)} = 7$

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81. Solve the equation $\sqrt{(6-4x-x^2)} = x+4$

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82. Solve the equation equation $\sqrt[3]{(2x-1)} + \sqrt[3]{(x-1)} = 1$

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83. Solve the equation

$\sqrt{(2x^2+5x-2)} - \sqrt{2x^2-5x-9} = 1$

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84. Solve the inequation $\sqrt[5]{\left[\frac{3}{x+1}+\frac{7}{x+2}\right]}<\sqrt[5]{\frac{6}{x-1}}$

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85. Solve the inequation $\sqrt{(x+14)}<(x+2)$

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86. Solve the inequation $\sqrt{\left(-x^2+4x-3\right)}>6-2x$

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87. Solve the equation $\sqrt{(6-x)}\left(3^{x^2-7.2x+3.9}-9\sqrt{3}\right)=0$

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88. Solve the equation $5^{x^2+3x+2}=1$

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89. Solve the equation $5^{2x} + 24.5^{x} - 25 = 0$.

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90. Solve the equation $64.9^{x} - 84(12^{x}) + 27(16^{x}) = 0$

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91. Solve the equation $15.2^{x+1} + 15.2^{2-x} = 135$

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92. Solve the equation $3^{x-4} + 5^{x-4} = 34$

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93. Solve the equation $5^x \sqrt[x]{8^{x-1}} = 500$

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94. Solve the inequation $3^{x+2} > \left(\frac{1}{9}\right)^{1/x}$.

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95. Solve the inequation $4^{x+1} - 16^x < 2\log_4 8$

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96. Solve the inequation $2^{2x^2-10x+3} + 6.2^{x^2-5x}.3^{x^2-5x} \geq 3^{2x^2-10x+3}$

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97. Solve the equation $\log_3(5 + 4\log_3(x-1)) = 2$

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98. Solve the equation $2x^{\log_4^3}+3^{\log_4^x=27}$

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99. Solve the equation $\log_{(\log_5 x)} 5 = 2$

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100. Solve the equation $\frac{1-2(2\log x)^2}{\log x - 2(\log x)^2} = 1$

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101. Solve the equation

$\log_x^3 10 - 6\log_x^2 10 + 11\log_x 10 - 6 = 0$

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102. Solve the equation $\log_{1/3}\left[2\left(\frac{1}{2}\right)^{x}-1\right]=\log_{1/3}\left[\left(\frac{1}{4}\right)^{x}-4\right]$

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103. Solve the equation $\log_{\left(\frac{2+x}{10}\right)}7=\log_{\left(\frac{2}{x+1}\right)}7.$

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104. Solve the equationi $\log_{(x^2-1)}(x^3+6)=\log_{(x^2-1)}(2x^2+5x)$

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105. Solve the equation $\log_{(x^3+6)}(x^2-1)=\log_{(2x^2+5x)}(x^2-1)$

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106. Number of real values of x satisfying the equation $\log_{x^2+6x+8}\left(\log_{2x^2+2x+3}\left(x^2-2x\right)\right)=0$ is equal to

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107. Solve the equatioin

$2\log 2x=\log\left(7x-2-2x^2\right)$

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108. Solve the equation $\log\left(3x^2+x-2\right)=3\log(3x-2)$.

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109. Solve the equation $2\log_3 x+\log_3\left(x^2-3\right)=\log_3 0.5+5^{\log_5\left(\log_3 8\right)}$

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110. Solve the equation $\log_2(3-x)-\log_2\left(\frac{\sin\frac{3\pi}{4}}{5-x}\right\}=\frac{1}{2}+\log_2(x+7)$

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111. Solve the inequation $\log_{2x+3}x^2<\log_{2x+3}(2x+3)$

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112. Solve the inequation $\log_{\left(\frac{x^2-12x+30}{10}\right)}\left(\log_2\left(\frac{2x}{5}\right)\right)>0$

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113. Solve the inequation $\log_{(x-3)}(2(x^2-10x+24)\geq lolg_{(x-3)}(x^2-9)$

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114. If α and $\beta(\alpha < \beta)$ are the roots of the equation $x^2 + bx + c = 0$, where $c < 0 < b$, then

A. $0 < \alpha < \beta$

B. $\alpha < 0 < \beta < |\alpha|$

C. $\alpha < \beta < 0$

D. $\alpha < 0 < |\alpha| < \beta$

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

A. $-2, \ -32$

B. $-2, 3$

C. $-6, 3$

D. $-6, \ -32$

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116. Let $f(x) = \int_1^x \sqrt{2-t^2}dt\cdot$ Then the real roots of the equation , $x^2 - f'(x) = 0$ are: ± 1 b. $\pm \frac{1}{\sqrt{2}}$ c.$\pm \frac{1}{2}$ d. $0 \& 1$

A. ± 1

B. $\pm \frac{1}{\sqrt{2}}$

C. $\pm \frac{1}{2}$

D. 0 and 1

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

A. 3

B. 9

C. 6

D. 12

Answer: B

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118. If $x_1, x_2, x_3, \ldots, x_n$ are the roots of the equation $x^n + ax + b = 0$, the value of

$(x_1 - x_2)(x_1 - x_3)(x_1 - x_4) \ldots \ldots (x_1 - x_n)$ is

A. $nx_1 + b$

B. $n(x_1)^{n-1}$

C. $n\left(x_1^{n-1}+a\right.$

D. $n(x_1)^{n-1}+b$

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119. If α, β are the roots of the equation $ax^2+bx+c=0$ and $A_n=\alpha^n+\beta^n$, then $aA_{n+2}+bA_{n+1}+cA+(n)$ is equal to

A. 0

B. 1

C. $a+b+c$

D. abc

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120. If x and y are positive integers such that, $xy + x + y = 71, x^2y + xy^2 = 880, then x^2 + y^2 =$

A. 125

B. 137

C. 146

D. 152

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121. If α, β are the roots of the equationn $x^2 - 3x + 5 = 0$ and γ, δ are the roots of the equation $x^2 + 5x - 3 = 0$, then the equation whose roots are $\alpha\gamma + \beta\delta$ and $\alpha\delta + \beta\gamma$ is

A. $x^2 - 15x - 158 = 0$

B. $x^2 + 15x - 158 = 0$

C. $x^2 - 15x + 158 = 0$

D. $x^2 + 15x + 158 = 0$

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122. The number of roots of the equation $\frac{1}{x} + \frac{1}{\sqrt{(1-x^2)}} = \frac{35}{12}$ is

A. 0

B. 1

C. 2

D. 3

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123. The sum of the roots of the equation $2^{33x-2}+2^{11x+2}=2^{22x+1}+1$ is

A. $\frac{1}{11}$

B. $\frac{2}{11}$

C. $\frac{3}{11}$

D. $\frac{4}{11}$

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124. For the equation $2x^2-6\sqrt{2}x-1=0$

A. roots are rational

B. roots are irrational

C. if one root is $(p+\sqrt{q})$, the other is $(-p+\sqrt{q})$

D. if one roots is $(p+\sqrt{q})$ the other is $(p-\sqrt{q})$

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125. Given that α, γ are roots of the equation $Ax^2 - 4x + 1 = 0, and\beta, \delta$ the roots of the equation of $Bx^2 - 6x + 1 = 0,$ such that $\alpha, \beta, \gamma, and\delta$ are in H.P., then a.$A = 3$ b. $A = 4$ $B = 2$ d. $B = 8$

A. $A = 3$

B. $A = 4$

C. $B = 2$

D. $B = 8$

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126. If $\left|ax^2 + bx + c\right| \leq 1$ for all x is $[0, 1]$,then

A. $|a| \leq 8$

B. $|b|l > 8$

C. $|c| \leq 1$

D. $|a| + |b| + |c| \leq 17$

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127. If $\cos^4\theta + p, \sin^4\theta + p$ are the roots of the equation $x^2 + a(2x+1) = 0$ and $\cos^2\theta + q, \sin^2\theta + q$ are the roots of the equation $x^2 + 4x + 2 = 0$ then a is equal to

A. -2

B. -1

C. 1

D. 2

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128. If α, β, γ are the roots fo $x^3 - x^2 + ax + b = 0$ and β, γ, δ are the roots of $x^3 - 4x^2 + mx + n = 0$. If α, β, γ and δ are INAP with common difference d then

A. $a = m$

B. $a = m - 5$

C. $n = b - a - 2$

D. $b = m + n - 3$

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129. If G and L are the greatest and least values of the expression $\dfrac{x^2 - x + 1}{x^2 + x + 1}, x \varepsilon R$ respectively then

The least value of $G^5 + L^5$ is

A. 0

B. 2

C. 16

D. 32

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130. If G and L are the greatest and least values of the expression $\frac{x^2-x+1}{x^2+x+1}, x \varepsilon R$ respectively then

G and L are the roots of the equation

A. $3x^2-10x+3=0$

B. $4x^2-17x+4=0$

C. $x^2-7x+10=0$

D. $x^2-5x+6=0$

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131. If G and L are the greatest and least values of the expression $\frac{x^2 - x + 1}{x^2 + x + 1}, x \varepsilon R$ respectively then

If $L < \lambda < G$ and $\lambda \varepsilon N$, the sum of all values of λ is

A. 2

B. 3

C. 4

D. 5

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132. Let a, b, c, d be real numbers in $G. P.$ If u, v, w satisfy the system of equations $u + 2y + 3w = 6, 4u + 5v + 6w = 12 \text{ and } 6u + 9v = 4$ then show that the roots of the equation

$$\left(\frac{1}{u}+\frac{1}{v}\frac{+}{w}\right)x^2+\left[(b-c)^2+(c-a)^2+(d-b)^2\right]x+u+v+w=0$$

and 20x^2+10(a-d)^2 x-9=0` are reciprocals of each other.

A. $a-d$

B. $(a-d)^2$

C. a^2-d^2

D. $(a+d)^2$

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133. Let a,b,c and d are real numbers in GP. Suppose u,v,w satisfy the system of equations $u+2y+3w=6, 4u+5y+6w=12$ and $6u+9v=4$. Further consider the expressions

$$f(x)=\left(\frac{1}{u}+\frac{1}{v}+\frac{1}{w}\right)x^2+\left[(b-c)^2+(c-a)^2+(x-b)^2\right]$$

$x+u+v+w=0$ and $g(x)=20x^2+10(a-d)^2x-9=0$

$(u+v+w)$ is equal to

A. 2

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

C. 20

D. $\frac{1}{20}$

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134. Let a, b, c, d be real numbers in $G.P.$ If u, v, w satisfy the system of equations $u + 2y + 3w = 6, 4u + 5v + 6w = 12$ and $6u + 9v = 4$ then show that the roots of the equation $\left(\frac{1}{u} + \frac{1}{v}\frac{+}{w}\right)x^2 + \left[(b-c)^2 + (c-a)^2 + (d-b)^2\right]x + u + v + w = 0$ and 20x^2+10(a-d)^2 x-9=0` are reciprocals of each other.

A. α, β

B. $-\alpha, \ -\beta$

C. $\frac{1}{\alpha}, \frac{1}{\beta}$

D. $-\frac{1}{\alpha}, \ -\frac{1}{\beta}$

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135. If the roots of the equation $10x^3 - cx^2 - 54x - 27 = 0$ are in harmonic progression the value of c is

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136. If a root of the equation $n^2 \sin^2 x - 2\sin x - (2n+1) = 0$ lies in $[0, \pi/2]$ the minimum positive integer value of n is

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137. Column I contain rational algebraic expressions and ColumnII contains possible integers which lie in their range. Match the entries of

Column I with one or more entries of the elements of Column II.

	Column I		Column II
(A)	$y=\frac{x^2-2x+9}{x^2+2x+9}, x \in R$	(p)	1
(B)	$y=\frac{x^2-3x-2}{2x-3}, x \in R$	(q)	3
(C)	$y=\frac{2x^2-2x+4}{x^2-4x+3}, x \in R$	(r)	−4
		(s)	−9

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138. Entries of column I are to be matched with one or more entries of column II.

	Column I		Column II
(A)	If $a+b+2c=0$ but $c \neq 0$, then $ax^2+bx+c=0$ has	(p)	atleast one root in $(-2, 0)$
(B)	If $a, b, c \in R$ such that $2a-3b+6c=0$, then equation has	(q)	atleast one root in $(-1, 0)$
(C)	Let a, b, c be non-zero real numbers such that	(r)	atleast one root in $(-1, 1)$
	$\int_0^1 (1+\cos^8 x)(ax^2+bx+c)dx = \int_0^2 (1+\cos^8 x)(ax^2+bx+c)dx$, the equation $ax^2+bx+c=0$ has	(s)	atleast one root in $(0, 1)$
		(t)	atleast one root in $(0, 2)$

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139. Statement 1 Roots of $x^2 - 2\sqrt{3}x - 46 = 0$ are rational.

Statement 2 Discriminant of $x^2 - 2\sqrt{3}x - 46 = 0$ isa perfect square.

A. Statement -1 is true, Statement -2 is true, Statement -2 is a correct explanation for Statement-1

B. Statement -1 is true, Statement -2 is true, Statement -2 is not a correct explanation for Statement -1

C. Statement -1 is true, Statement -2 is false

D. Statement -1 is false, Statement -2 is true

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140. Statement 1 The equation $a^x + b^x + c^x - d^x = 0$ has only real root, if $a > b > c > d$.

Statement 2 If $f(x)$ is either strictly increasing or decreasing function, then $f(x)=0$ has only real root.

A. Statement -1 is true, Statement -2 is true, Statement -2 is a correct explanation for Statement-1

B. Statement -1 is true, Statement -2 is true, Statement -2 is not a correct explanation for Statement -1

C. Statement -1 is true, Statement -2 is false

D. Statement -1 is false, Statement -2 is true

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141. If α and β are the roots of $x^2-p(x+1)-c=0$, then the value of $\frac{\alpha^2+2\alpha+1}{\alpha^2+2\alpha+c}+\frac{\beta^2+2\beta+1}{\beta^2+2\beta+c}$

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142. 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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143. If the roots of the equation $ax^2 + bx + c = 0 (a \neq 0)$ be α and β and those of the equation $Ax^2 + Bx + C = 0 (A \neq 0)$ be $\alpha + k$ and $\beta + k$.Prove that

$$\frac{b^2 - 4ac}{B^2 - 4AC} = \left(\frac{a}{A}\right)^2$$

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

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145. Find a quadratic equation whose roots x_1 and x_2 satisfy the condition $x_1^2 + x_2^2 = 5, 3\left(x_1^5 + x_2^5\right) = 11\left(x_1^3 + x_2^3\right)$ (assume that x_1, x_2 are real)

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146. If each pair of the three equations $x^2 + ax + b = 0, x^2 + cx + d = 0$ and $x^2 + ex + f = 0$ has exactly one root in common then show that $(a + c + e)^2 = 4(ac) + ce + ea - b - d - f$

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147. 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 Iterms of $p, q, r, and s.$ Deduce the condition that the equation has a common root.

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148. Find all integral values of a for which the quadratic expression $(x-a)(x-10)+1$ can be factored as a product $(x+\alpha)(x+\beta)$ of two factors and $\alpha, \beta \in I$.

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149. Solve $\sqrt{x+3-4\sqrt{x-1}}+\sqrt{x+8-6\sqrt{x-1}}=1$

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150. Solve for x

$1!+2!+3!+\ldots\ldots\ldots\ldots+(x-1)!+x \neq k^2$ and $k \varepsilon I$

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151. Find the value of x in $\sqrt{x+2\sqrt{x+2\sqrt{x+2\sqrt{3x}}}}=x$.

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152. Solve the inequation $\left(x^2+x+1\right)^x<1$

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153. Solve the equation $1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\frac{1}{x}}}}}=x$ When in expression on left hand side the sign of a fraction is repeated n times.

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154. Solve the system of equations

$$\begin{cases}|x-1|+|y-2|=1\\ y=2-|x-1|\end{cases}$$

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155. Let a, b, c be real. If $ax^2 + bx + c = 0$ has two real roots $\alpha and \beta, where \alpha \langle -1 and \beta \rangle 1$, then show that $1 + \frac{c}{a} + \left|\frac{b}{a}\right| < 0$

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156. Solve the equation $x\left(\frac{3-x}{x+1}\right) + \left(x + \frac{3-x}{x+1}\right) = 2$

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157. Show that for any real numbers $a_3, a_4, a_5, \ldots\ldots\ldots a_{85}$, the roots of the equation

$a_{85}x^{85} + a_{84}x^{84} + \ldots\ldots\ldots + a_3x^3 + 3x^2 + 2x + 1 = 0$ are not real.

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158. Solve the equation

$2^{|x+1|} - 2^x = |2^x - 1| + 1$

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159. Solve the inequation

$$-|y| + x - \sqrt{(x^2 + y^2 - 1)} \geq 1$$

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160. If $a_1, a_2, a_3 ......a_n (n \geq 2)$ are read and $(n-1)a_1^2 - 2na_2 < 0$ then prove that at least two roots of the equation $x^n + a_1x^{n-1} + a_2x^{n-2} + ... + a_n = 0$are imaginary.

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161. Solve the inequation $\left|a^{2x} + a^{x+2} - 1\right| \geq 1$ for all values of $a(a > 0, a \neq 1)$

View Text Solution

162. Solve the inequation $\log_{|x|}\left(\sqrt{(9-x^2)}-x-1\right)\geq 1$

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163. Find all the values of the parameter 'a' for which the inequality $4^x-a2^x-a+3\leq 0$ is satisfied by at least one real x.

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164. Find all values of the parameter a for which the inequality $a.9^x+4(a-1)3^x+a>1$ is satisfied for all real values of x

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Exercise For Session 1

1. यदि $\left(a^2-1\right)x^2+(a-1)x+a^2-4a+3=0;\;\; x$ में एक सर्वसमिका है तब, $a=$.

A. -1

B. 1

C. 3

D. $-1, 1, 3$

Answer: B

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2. The roots of the equation $x^2 - 2\sqrt{3}x + 3 = 0$ are

A. real and unequal

B. rational and equal

C. irrational and equal

D. irrational and unequal

Answer: C

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3. The roots of the quadratic equation $(a+b-2c)x^2+(2a-b-c)x+(a-2b+c)=0$ are

A. rational

B. non-real

C. irrational

D. equal

Answer: A

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4. If $P(x)=ax^2+bx+c, Q(x)=-ax^2+dx+c$ where $ac \neq 0$ then $P(x). Q(x)=0$ has

A. four real roots

B. two real roots

C. four imaginary roots

D. none of these

Answer: B

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

A. AP

B. GP

C. HP

D. AGP

Answer: A

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6. If one root of the quadratic equation $ix^2 - 2(i+1)x + (2-i) = 0, i = \sqrt{-1}$ is $2-i$, the other root is

A. $-i$

B. i

C. $2+i$

D. $2-i$

Answer: A

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7. If the difference of the roots of $x^2 - \lambda x + 8 = 0$ be 2 the value of λ is

A. ± 2

B. ± 4

C. ± 6

D. ± 8

Answer: C

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8. If $3p^2 = 5p + 2$ and $3q^2 = 5q + 2$ where $p \neq q$, pq is equal to

A. $\frac{2}{3}$

B. $-\frac{2}{3}$

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

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

Answer: B

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9. If α, β are the roots of the quadratic equation $x^2 + bx - c = 0$, the equation whose roots are b and c, is

A. $x^2 + \alpha x - \beta - 0$

B. $x^2 - [(\alpha + \beta) + \alpha\beta]x - \alpha\beta(\alpha + \beta) = 0$

C. $x^2 + [(\alpha + \beta) + \alpha\beta]x + \alpha\beta(\alpha + \beta) = 0$

D. $x^2 + [(\alpha + \beta) + \alpha\beta)]x - \alpha\beta(\alpha + \beta) = 0$

Answer: C

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

A. 15

B. 9

C. 8

D. 7

Answer: D

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11. If α and β are the roots of the equation $ax^2 + bx + c = 0(a \neq 0; a, b, c$ being different), then $(1 + \alpha + \alpha^2)(1 + \beta + \beta^2) =$

A. zero

B. positive

C. negative

D. none of these

Answer: B

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Exercise For Session 2

1. If α and β are the roots of the equation $2x^2 - 3x + 4 = 0$, then the equation whose roots are α^2 and β^2, is

A. $4x^2 + 7x + 16 = 0$

B. $4x^2 + 7x + 6 = 0$

C. $4x^2 + 7x + 1 = 0$

D. $4x^2 - 7x + 16 = 0$

Answer: A

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2. If α, β are the roots of $x^2 - 3x + 1 = 0$, then the equation whose roots are $\left(\frac{1}{\alpha - 2}, \frac{1}{\beta - 2}\right)$ is

A. $x^2 + x - 1 = 0$

B. $x^2 + x + 1 = 0$

C. $x^2 - x - 1 = 0$

D. none of these

Answer: C

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3. The equation formed by decreasing each root of $ax^2 + bx + c = 0$ by 1 is $2x^2 + 8x + 2 = 0$ then

A. $a = -b$

B. $b = -c$

C. $c = -a$

D. $b = a + c$

Answer: B

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4.. For what value of m will the equation $\frac{x^2 - bx}{ax - c} = \frac{m-1}{m+1}$ have roots equal in magnitude but opposite in sign?

A. $\frac{a-b}{a+b}$

B. $\frac{b-a}{a+b}$

C. $\frac{a+b}{a-b}$

D. $\frac{b+a}{b-a}$

Answer: A

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5. If $x^2 + px + q = 0$ is the quadratic equation whose roots are $a - 2andb - 2$ where $aandb$ are the roots of $x^2 - 3x + 1 = 0,$ then $p - 1, q = 5$ b. $p = 1, 1 = -5$ c. $p = -1, q = 1$ d. $p = 1, q = -1$

A. $p = 1, q = 5$

B. $p = 1, q = -5$

C. $p = -1, q = 1$

D. none of these

Answer: D

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6. If both roots of the equation $x^2 - (m-3)x + m = 0 \ (m\varepsilon R)$ are positive, then

A. $m\varepsilon(3, \infty)$

B. $m\varepsilon(-\infty, 1]$

C. $m\varepsilon[9, \infty)$

D. $m\varepsilon(1, 3)$

Answer: C

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7. If the equation $(1+m)x^2-2(1+3m)x+(1-8m)=0$ where $m\varepsilon R\sim\{-1\}$, has atleast one root is negative, then

A. $m\varepsilon(-\infty, -1)$

B. $m\varepsilon\left(-\frac{1}{8}, \infty\right)$

C. $m\varepsilon\left(-1-\frac{1}{8}\right)$

D. $m\varepsilon R$

Answer: C

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8. If bot the roots of $\lambda\left(6x^2+3\right)+rx+2x^2-1=0$ and $6\lambda\left(2x^2+1\right)+px+4x^2-2=0$ are common, then $2r-p$ is equal to

A. -1

B. 0

C. 1

D. 2

Answer: B

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9. If $ax^2+bx+c=0$ and $bx^2+cx+a=0$ have a common root and $a\ne 0$ then $\frac{a^3+b^3+c^3}{abc}$ is A. 1 B. 2 C. 3 D. 9

A. 1

B. 2

C. 3

D. none of these

Answer: C

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10. If $a(p+q)^2+2bpq+c=0abda(p+r)^2+2bpr+c=0(a\neq 0)$,

then $qr=p^2$ b. $qr=p^2+\frac{c}{a}$ c. $qr=p^2$ d. none of these

A. $p^2+\frac{c}{a}$

B. $p^2=\frac{a}{c}$

C. $p^2+\frac{a}{b}$

D. $p^2+\frac{b}{a}$

Answer: A

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Exercise For Session 3

1. If x is real, the maximum and minimum values of expression $\frac{x^2+14x+9}{x^2+2x+3}$ will be

A. $4, \ -5$

B. $5, \ -4$

C. $-4, 5$

D. $-4, \ -5$

Answer: A

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2. If x is real, the expression $\frac{x+2}{2x^2+3x+6}$ takes all value in the interval

A. $\left(\frac{1}{13}, \frac{1}{3}\right)$

B. $\left[-\frac{1}{13}, \frac{1}{3}\right]$

C. $\left(-\frac{1}{3}, \frac{1}{13}\right)$

D. none of these

Answer: B

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3. If x is real, then the minimum value of the expression $x^2 - 8x + 17$ is

A. -1

B. 0

C. 1

D. 2

Answer: C

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4. 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. $1/2$

A. $-\frac{1}{2}$

B. 0

C. $\frac{1}{4}$

D. $\frac{1}{2}$

Answer: C

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

A. $1<m<5$

B. $-1<m<5$

C. $1<m<6$

D. $m<\frac{71}{24}$

Answer: D

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6. the largest negative integer which satisfies $\frac{x^2-1}{(x-2)(x-3)}>0$

A. -4

B. -3

C. -2

D. -1

Answer: C

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7. Find the values of m for which the expression $2x^2 + mxy + 3y^2 - 5y - 2$ can be resolved into two rational linear factors.

A. 3

B. 5

C. 7

D. 9

Answer: C

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8. If $c > 0$ and $4a + c < 2b$ then $ax^2 - bx + c = 0$ has a root in the interval

A. (0,2)

B. (2,4)

C. (0,1)

D. (-2,0)

Answer: A

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9. If the roots of the equation $x^2 - 2ax + a^2 + a - 3 = 0$ are real and less than 3, then (1999, 2M) $a < 2$ (b) $2 \leq a \leq 3$ `34`

A. $a < 2$

B. $2 \leq a \leq 3$

C. $3 < a \leq 4$

D. $a > 4$

Answer: A

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10. The set of values of a for which the inequality, $x^2 + ax + a^2 + 6a < 0$ is satisfied for all $x belongs (1, 2)$ lies in the interval:

A. (1,2)

B. $[1, 2]$

C. $[-7, 4]$

D. none of these

Answer: D

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Exercise For Session 4

1. If α, β, γ are the roots of $x^3 - x^2 - 1 = 0$ then the value of $\frac{1+\alpha}{1-\alpha} + \frac{1+\beta}{1-\beta} + \frac{1+\gamma}{1-\gamma}$ is equal to -5 b. -6 c. -7 d. -2

A. -7

B. -6

C. -5

D. -4

Answer: C

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2. Let $r, s, andt$ be the roots of equation $8x^2 + 1001x + 2008 = 0$. Then find the value of .

A. 751

B. 752

C. 753

D. 754

Answer: C

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

A. 9

B. 11

C. 13

D. 15

Answer: C

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4. If a, b, c, d are four consecutive terms of an increasing A.P., then the roots of the equation $(x-a)(x-c)+2(x-b)(x-d)=0$ are a. non-real complex b. real and equal c. integers d. real and distinct

A. non real complex

B. real and equal

C. integers

D. real and distinct

Answer: D

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5. If $x^2 + px = 1$ is a factor of the expression $ax^3 + bx = c$, then $a^2 - c^2 = ab$ b. $a^2 + c^2 = -ab$ c. $a^2 - c^2 = -ab$ d. none of these

A. $a^2 - c^2 = ab$

B. $a^2 + c^2 = -ab$

C. $a^2 - c^2 = -ab$

D. none of these

Answer: A

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6. The number of real roots of the equation $|x|^2 - 3|x| + 2 = 0$, is

A. 1

B. 2

C. 3

D. 4

Answer: D

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

A. $2x$

B. $-2x$

C. x

D. $-x$

Answer: D

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8. The product of all the solutions of the equation $(x-2)^2 - 3|x-2| + 2 = 0$ is

A. 2

B. -4

C. 0

D. none of these

Answer: C

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9. If $0 < x < 1000$ and $\left[\frac{x}{2}\right] + \left[\frac{x}{3}\right] + \left[\frac{x}{5}\right] = \frac{31}{30}x$, (where $[.]$ denotes the greatest integer function then number of possible values of x.

A. 32

B. 33

C. 34

D. none of these

Answer: B

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10. If $[x]$ is the greatest integer less than or equal to x and (x) be the least integer greater than or equal to x and $[x]^2 + (x)^2 > 25$ then x belongs to

A. $[3, 4]$

B. $(-\infty, -4]$

C. $[4, \infty)$

D. $(-\infty, -4] \cup [4, \infty)$

Answer: D

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Exercise For Session 5

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

A. no solution

B. one solution

C. two solutions

D. more than two solutions

Answer: A

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2. The number of real solutions of $\sqrt{x^2-4x+3}+\sqrt{x^2-9}=\sqrt{4x^2-14x+6}$

A. one

B. two

C. three

D. none of these

Answer: A

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

A. one

B. two

C. three

D. none of these

Answer: B

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4. Find the number of integal values of x satisfying

$\sqrt{-x^2+10x-16} < x-2$

A. 0

B. 1

C. 2

D. 3

Answer: C

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5. 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

A. 2

B. 1

C. 0

D. none of these

Answer: C

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6. The set of all x satisfying $3^{2x} - 3x^x - 6 > 0$ is given by

A. $0 < x < 1$

B. $x > 1$

C. $x > 3^{-2}$

D. none of these

Answer: B

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7. The number of real solutions of equation $2^{\frac{x}{2}} + (\sqrt{2}+1)^x = (5+2\sqrt{2})^{\frac{x}{2}}$ is

A. one

B. two

C. four

D. infinite

Answer: A

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

A. 3

B. 0

C. 2

D. none of these

Answer: B

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9. The number of real solutions of the equation $\log_{0.5} x = |x|$ is

A. 0

B. 1

C. 2

D. none of these

Answer: B

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10. The inequality $(x-1)In(2-x)<0$ holds, if x satisfies

A. $1<x<2$

B. $x>0$

C. $0<x<1$

D. none of these

Answer: D

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Exercise (Single Option Correct Type Questions)

1. If a, b, c are real and $a \neq b$, then the roots ofthe equation, $2(a-b)x^2-11(a+b+c)x-3(a-b)=0$ are :

A. real and equation

B. real and unequal

C. purely imaginary

D. none of these

Answer: B

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2. There is only one real value of a for which the quadratic equation $ax^2 + (a+3)x + a - 3 = 0$ has two positive integral solutions. The product of these two solutions is

A. 0.09

B. 0.08

C. 0.06

D. 12

Answer: B

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3. If for all real values of a one root of the equation $x^2 - 3ax + f(a) = 0$ is double of the other, then f(x) is equal to

A. $2x$

B. x^2

C. $2x^2$

D. $2\sqrt{x}$

Answer: C

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

A. $x^2 - 2x + 4 = 0$

B. $x^2 - 4x + 4 = 0$

C. $x^2 + 2x + 4 = 0$

D. $x^2 + 4x + 4 = 0$

Answer: A

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5. If both roots of the equation $x^2 - 2ax + a^2 - 1 = 0$ lie between $(-2, 2)$ then a lies in the interval

A. R

B. $(-1, 1)$

C. $(-2, 2)$

D. $(-3, -1) \cup (1, 3)$

Answer: B

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6. If $(-2, 7)$ is the highest point on the graph of $y = -2x^2 - 4ax + \lambda$, then λ equals

A. 31

B. 11

C. -1

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

Answer: C

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7. 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 integral values of p is 1 b. 2 c. 3 d. 4

A. 1

B. 2

C. 3

D. 4

Answer: B

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8. Solution of the equation $3^{2x^2} - 2.3^{x^2+x+6} + 3^{2(x+6)}$ =0 is

A. $\{-3, 2\}$

B. $\{6, -1\}$

C. $\{-2, 3\}$

D. $\{1, -6\}$

Answer: C

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9. Consider two quadratic expressions $f(x) = ax^2 + bx + c$ and $g(x) = ax^2 + px + c$, $(a, b, c, p, q \in R, b \neq p)$ such that their discriminants are equal. If $f(x) = g(x)$ has a root $x = \alpha$, then

A. α will be AM of the roots of $f(x) = 0$ and $g(x) = 0$

B. α will be AM of the roots of $f(x) = 0$

C. α will be AM of the roots of $f(x) = 0$ or $g(x) = 0$

D. α will be AM of the roots of $g(x) = 0$

Answer: A

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10. If x_1 and x_2 are the arithmetic and harmonic means of the roots fo the equation $ax^2 + bx + c = 0$, the quadratic equation whose roots are x_1 and x_2 is

A. $abx^2 + (b^2 + ac)x + bc = 0$

B. $2abx^2 + (b^2 + 4ac)x + 2bc = 0$

C. $2abx^2 + (b^2 + ac)x + bc = 0$

D. none of these

Answer: B

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11. $f(x)$ is a cubic polynomial $x^3 + ax^2 + bx + c$ such that $f(x) = 0$ has three distinct integral roots and $f(g(x)) = 0$ does not have real roots, where $g(x) = x^2 + 2x - 5,$ the minimum value of $a + b + c$ is

A. 504

B. 532

C. 719

D. 764

Answer: C

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12. The value of the positve integer n for which the quadratic equation $\sum_{k=1}^{n}(x+k-1)(x+k)=10n$ has solutions α and $\alpha+1$ for some α is

A. 7

B. 11

C. 17

D. 25

Answer: B

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13. If one root of the equation $x^2-\lambda x+12=0$ is even prime while $x^2+\lambda x+\mu=0$ has equal roots, then μ is

A. 8

B. 16

C. 24

D. 32

Answer: B

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14. Number of real roots of the equation $\sqrt{x}+\sqrt{x-\sqrt{(1-x)}}=1$ is

A. 0

B. 1

C. 2

D. 3

Answer: B

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15. The value of $\sqrt{7+\sqrt{7-\sqrt{7+\sqrt{7-\ldots}}}}$ upto ∞ is

A. 5

B. 4

C. 3

D. 2

Answer: C

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16. For any value of x the expression $2(k-x)\left(x+\sqrt{x^2+k^2}\right)$ cannot exceed

A. k^2

B. $2k^2$

C. $3k^2$

D. none of these

Answer: B

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17. Given that, for all real x, the expression $\frac{x^2+2x+4}{x^2-2x+4}$ lies between $\frac{1}{3}$ and 3. The values between which the expression $\frac{9.3^{2x}+6.3^x+4}{9.3^{2x}-6.3^x+4}$ lies are

A. -3 and 1

B. $\frac{3}{2}$ and 2

C. -1 and 1

D. 0 and 2

Answer: B

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18. Let α, β, γ be the roots of $(x-a)(x-b)(x-c)=d, d \neq 0$, then the roots of the equation $(x-\alpha)(x-\beta)(x-\gamma)+d=0$ are :

A. a,b,d

B. b,c,d

C. a,b,c

D. $a+d, b+d, c+d$

Answer: C

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19. If one root of the quadratic equation $ix^2-2(i+1)x+(2-i)=0, i=\sqrt{-1}$ is $2-i$, the other root is

A. $3+i$

B. $3+\sqrt{-1}$

C. $-1+i$

D. $-1-i$

Answer: D

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20. The number of solutions of $|[x]-2x|=4, \text{where}[x]]$ is the greatest integer less than or equal to x, is

A. infinite

B. 4

C. 3

D. 2

Answer: A

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21. if x^2+x+1 is a factor of ax^3+bx^2+cx+d then the real root of $ax^3+bx^2+cx+d=0$ is : (a) $-\frac{d}{a}$ (B) $\frac{d}{a}$ (C) $\frac{a}{b}$ (D)none of these

A. $-\frac{d}{a}$

B. $\frac{d}{a}$

C. $\frac{a}{d}$

D. none of these

Answer: A

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22. THe value of x which satisfy the equation $\left(\sqrt{5x^2-8x+3}\right)-\sqrt{(5x^2-9x+4)}=\sqrt{(2x^2-2x)}-\sqrt{(2x^2-3x+$ is

A. 3

B. 2

C. 1

D. 0

Answer: C

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23. the roots of the equation $(a+\sqrt{b})^{x^2-15}+(a-\sqrt{b})^{x^2-15}=2a$ where $a^2-b=1$ are

A. $\pm 2, \ \pm \sqrt{3}$

B. $\pm 4, \ \pm \sqrt{14}$

C. $\pm 3, \ \pm \sqrt{5}$

D. $\pm 6, \ \pm \sqrt{20}$

Answer: B

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24. The number of pairs (x,y) which will satisfy the equation $x^2 - xy + y^2 = 4(x + y - 4)$ is

A. 1

B. 2

C. 4

D. none of these

Answer: A

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25. The number of positive integral solutions of $x^4 - y^4 = 3789108$ is

A. 0

B. 1

C. 2

D. 4

Answer: A

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26. if $x^3 + ax + 1 = 0$and $x^4 + ax^2 + 1 = 0$ have common root then the exhaustive set of value of a is

A. $a = 2$

B. $a = -2$

C. $a = 0$

D. none of these

Answer: B

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27. The value of a for which the equation $(1 - a^2)x^2 + 2ax - 1 = 0$ has roots belonging to $(0, 1)$ is

A. $a > 0$

B. $a < 0$

C. $a > 2$

D. none of these

Answer: C

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28. Solution set of $x - \sqrt{1 - |x|} < 0$, is

A. $\left[-1, \frac{-1+\sqrt{5}}{2}\right)$

B. $[-1, 1]$

C. $\left[-1, \frac{-1+\sqrt{5}}{2}\right]$

D. $\left(-1, \frac{-1+\sqrt{5}}{2}\right)$

Answer: A

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29. If the quadratic equations, $ax^2 + 2cx + b = 0 and ax^2 + 2bx + c = 0 (b \neq c)$ have a common root, then $a + 4b + 4c$ is equal to: a. -2 b. -2 c. 0 d. 1

A. -2

B. -1

C. 0

D. 1

Answer: C

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SCQ_TYPE

1. The graph of a quadratic polynomial $y = a \times^2 + bx + c, a, b, \varepsilon R$ is a shown.

Which one of the following is not correct

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

B. $\frac{c}{a} < 0$

C. c is negative

D. Abscissa corresponding to the vertex is $\left(-\frac{b}{2a}\right)$

Answer: B

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Exercise (More Than One Correct Option Type Questions)

1. If $0 < a < b < c$ and the roots α, β of the equation $ax^2 + bx + c = 0$ are non-real complex numbers, that

A. $|\alpha| = |\beta|$

B. $|\alpha| > 1$

C. $|\beta| < 1$

D. none of these

Answer: A::B

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2. If A, G and H are the arithmetic mean, geometric mean and harmonic mean between unequal positive integers. Then, the equation $Ax^2 - IGlx - H = 0$ has (a) both roots are fractions (b) atleast one root which is negatuve fraction (c) exactly one positive root (d) atleast one root which is an integer

A. both roots are fractioins

B. atleast one root which is negative fraction

C. exactly one positive root

D. atleast one root which is an integer

Answer: B::C

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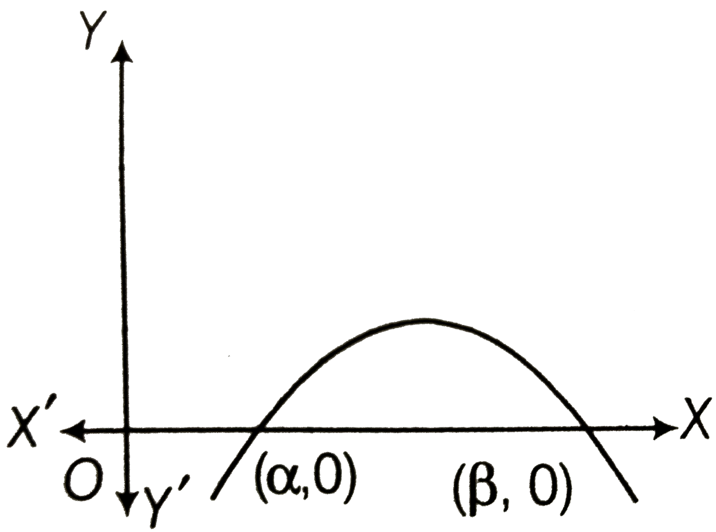
3. The adjoining graph of $y = ax^2 + bx + c$ shows that



A. $a < 0$

B. $b^2 < 4ac$

C. $c > 0$

D. a and b are of opposite signs

Answer: A::D

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4. $ax^2 + bx + c = 0 (a > 0)$, has two roots α and β such $\alpha < -2$ and $\beta > 2$, then

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

B. $c < 0$

C. $a + |b| + c < 0$

D. $4a + 2|b| + c < 0$

Answer: A::B::C::D

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5. If $b^2 \geq 4ac$ for the equation $ax^4 + bx^2 + c = 0$ then all the roots of the equation will be real if

A. $b > 0, a < 0, c > 0$

B. $b < 0, a > 0, c > 0$

C. $b > 0, a > 0, c > 0$

D. $b > 0, a < 0, c < 0$

Answer: B::D

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6. If the roots of the equation $x^3 + bx^2 + cx - 1 = 0$ form an increasing G.P., then b belongs to the interval

A. $b + c = 0$

B. $b\varepsilon(-\infty, -3)$

C. one of the roots is 1

D. one root is smaller than one and one root is more than one

Answer: A::B::C::D

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7. Let $f(x) = ax^2 + bx + c$, where $a, b, c \in R, a \neq 0$. Suppose $|f(x)| \leq 1, x \in [0, 1]$, then

A. $|a| \leq 8$

B. $|b| \leq l8$

C. $|c| \leq 1$

D. $|a| + |b| + |c| \leq 17$

Answer: A::B::C::D

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8. $\cos\alpha$ is a root of the equation `25 x^2+5x-12=0,-1

A. `24/25

B. $-\frac{12}{25}$

C. $-\frac{24}{25}$

D. $\frac{20}{25}$

Answer: A::C

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9. If $a, b, c \varepsilon R(a \neq 0)$ and $a + 2b + 4c = 0$ then equatio $ax^2 + bx + c = 0$ has

A. atleast one positive root

B. atleast one non-integral root

C. both integral roots

D. no irrational root

Answer: A::B

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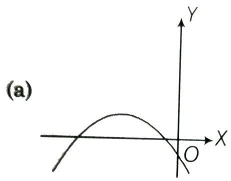
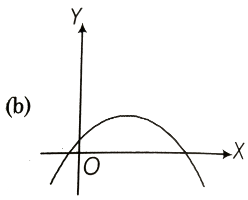
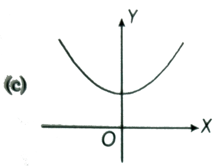
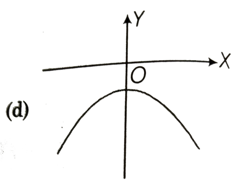
10. For which of the following graphs of the quadratic expression $f(x) = ax^2 + bx + c$, the product of abc is negative

A. 

B. 

C. 

D. 

Answer: A::B::C::D

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11. If $a, b \in R$ and $ax^2 + bx + 6 = 0, a \neq 0$ does not have two distinct real roots, then :

A. minimum possible value of $3a + b$ is -2

B. minimum possible value of $3a + b$ is 2

C. minimum possible value of $6a + b$ is -1

D. minimum possible value of $6a + b$ is 1

Answer: A::C

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12. 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

Answer: B::C

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

A. $b < 0 < a$

B. $a < o < b$

C. $b < a < 0$

D. $b > a > 0$

Answer: C::D

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14. 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 $a = 0, b = 3$ b. $a = b = 0$ c. $a = b = 3$ d. $a, b,$ are roots of $x^2 + x + 2 = 0$

A. $a = b = 0$

B. $a = 0, b = 3$

C. $a = b = 3$

D. a, b are roots of $x^2 + x + 2 = 0$

Answer: A::C::D

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15. $ax^2 + bx + c = 0 (a > 0),$ has two roots α and β such $\alpha < -2$ and $\beta > 2,$ then

A. $4a - 2|b| + c < 0$

B. $9a - 3|b| + c < 0$

C. $a - |b| + c < 0$

D. $c < 0, b^2 - 4ac > 0$

Answer: A::C::D

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Exercise (Passage Based Questions)

1. If G and L are the greatest and least values of the expression $\frac{2x^2 - 3x + 2}{2x^2 + 3x + 2}, x \varepsilon R$ respectively.

The least value of $G^{100} + L^{100}$ is

A. 2^{100}

B. 3^{100}

C. 7^{100}

D. none of these

Answer: D

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2. If G and L are the greatest and least values of the expression $\frac{2x^2 - 3x + 2}{2x^2 + 3x + 2}, x \varepsilon R$ respectively.

G and L are the roots of the equation

A. $5x^2 - 26x + 5 = 0$

B. $7x^2 - 50x + 7 = 0$

C. $9x^2 - 82x + 9 = 0$

D. $11x^2 - 122x + 11 = 0$

Answer: B

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3. If G and L are the greatest and least values of the expression $\frac{2x^2-3x+2}{2x^2+3x+2}, x\varepsilon R$ respectively. If $L^2<\lambda<G^2, \lambda\varepsilon N$ the sum of all values of λ is

A. 1035

B. 1081

C. 1225

D. 1176

Answer: D

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4. If the roots of the equaion $x^4-12x^3+cx^2+dx+81=0$ are positive then the value of c is The value of d is. Roots of the equation 2cx+d=0 is

A. -27

B. 27

C. -54

D. 54

Answer: D

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5. If the roots of the equaion $x^4 - 12x^3 + cx^2 + dx + 81 = 0$ are positive then the value of c is The value of d is. Roots of the equation 2cx+d=0 is

A. -27

B. -54

C. -81

D. -108

Answer: D

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6. If the roots of the equaion $x^4 - 12x^3 + cx^2 + dx + 81 = 0$ are positive then the value of c is The value of d is. Roots of the equation 2cx+d=0 is

A. -1

B. $-\frac{1}{2}$

C. 1

D. $\frac{1}{2}$

Answer: C

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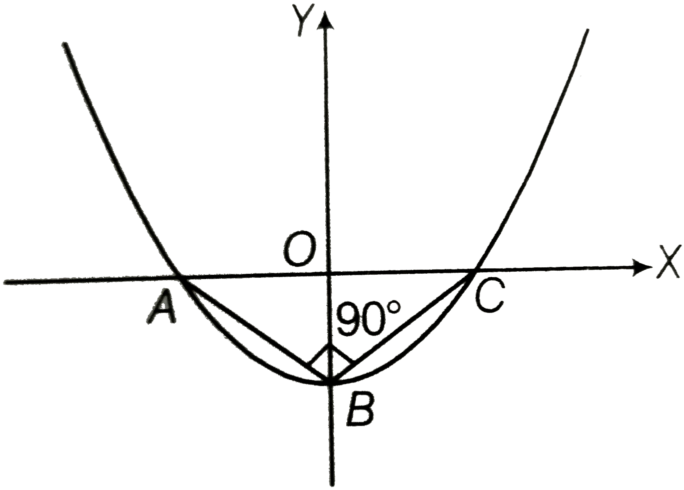
7. In the given figue vertices of ΔABC lie on $y = f(x) = ax^2 + bx + c.$ The ΔAB is right angled isosceles triangle whose hypotenuse $AC = 4\sqrt{2}$ units.



$y = f(x)$ is given by

A. $y = -x^2 - 8$

B. $y = \frac{x^2}{2\sqrt{2}} - 2\sqrt{2}$

C. $y = x^2 - 4$

D. $y = \frac{x^2}{2} - \sqrt{2}$

Answer: B

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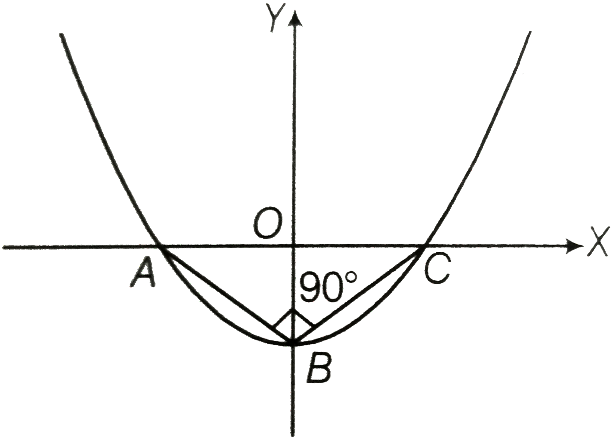
8. In the given figue vertices of ΔABC lie on $y = f(x) = ax^2 + bx + c$. The ΔAB is right angled isosceles triangle whose hypotenuse $AC = 4\sqrt{2}$ units.



Minimum valueof $y = f(x)$ is

A. $-4\sqrt{2}$

B. $-2\sqrt{2}$

C. 0

D. $2\sqrt{2}$

Answer: B

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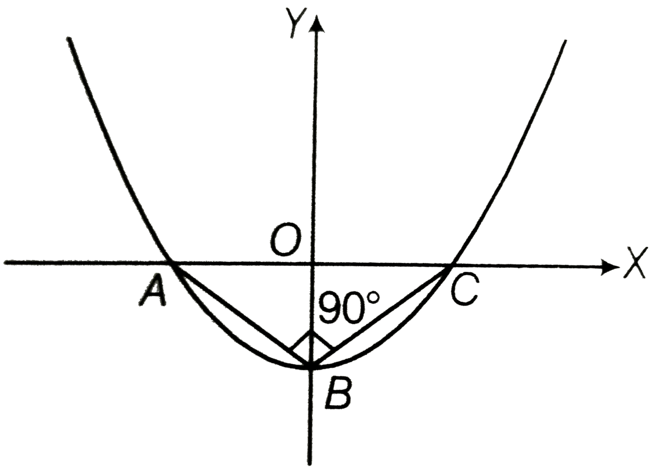
9. In the given figue vertices of ΔABC lie on $y = f(x) = ax^2 + bx + c$. The ΔAB is right angled isosceles triangle whose hypotenuse $AC = 4\sqrt{2}$ units.



Number of integral value of λ for which $\dfrac{\lambda}{2}$ lies between the roots of $f(x) = 0$, is

A. 9

B. 10

C. 11

D. 12

Answer: C

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10. Let $f(x) = x2 + b_1x + c_1$. $g(x) = x^2 + b_2x + c_2$. Real roots of $f(x) = 0$ be α, β and real roots of $g(x) = 0$ be $\alpha + \gamma, \beta + \gamma$. Least values of $f(x)$ be $-\frac{1}{4}$Least value of $g(x)$ occurs at $x = \frac{7}{2}$

A. -8

B. -7

C. -6

D. 5

Answer: B

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11. Let $f(x) = x2 + b_1x + c_1$. $g(x) = x^2 + b_2x + c_2$. Real roots of $f(x) = 0$ be α, β and real roots of $g(x) = 0$ be $\alpha + \gamma, \beta + \gamma$. Least values of $f(x)$ be $-\frac{1}{4}$Least value of $g(x)$ occurs at $x = \frac{7}{2}$

A. -1

B. $-\frac{1}{2}$

C. $-\frac{1}{3}$

D. $-\frac{1}{4}$

Answer: D

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12. Let $f(x) = x^2 + bx + c$ and $g(x) = x^2 + b_1x + c_1$ Let the real roots of $f(x) = 0$ be α, β and real roots of $g(x) = 0$ be $\alpha + k, \beta + k$ fro same constant k. The least value fo $f(x)$ is $-\frac{1}{4}$ and least value of $g(x)$ occurs at $x = \frac{7}{2}$ The roots of $g(x) = 0$ are

A. 3,4

B. $-3, 4$

C. $-3, \ -4$

D. $3, \ -4$

Answer: A

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13. If $ax^2 - bx + c = 0$ have two distinct roots lying in the interval $(0, 1); a, b, \ \in N$, then the least value of a , is

A. 3

B. 4

C. 5

D. 6

Answer: C

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14. If $ax^2 + bx + c = 0$ have two distinct roots lying int eh interval $(0, 1), a, b, c \varepsilon N$ The least value of b is

A. 5

B. 6

C. 7

D. 8

Answer: A

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15. If $ax^2 - bx + c = 0$ have two distinct roots lying int eh interval $(0, 1), a, b, ce\pi slonN$ The least value of $\log_5 abc$ is

A. 1

B. 2

C. 3

D. 4

Answer: B

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16. If $2x^3 + ax^2 + bx + 4 = 0$ (a and b are positive real numbers) has three real roots.

The minimum value of a^3 is

A. 108

B. 216

C. 432

D. 864

Answer: C

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17. If $2x^3 + ax^2 + bx + 4 = 0$ (a and b are positive real numbers) has three real roots.

The minimum value of b^3 is

A. 432

B. 864

C. 1728

D. none of these

Answer: B

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18. If $2x^3 + ax^2 + bx + 4 = 0$ (a and b are positive real numbers) has three real roots.

The minimum value of $(a + b)^3$ is

A. 1728

B. 3456

C. 6912

D. 864

Answer: C

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19. If α, β, γ are the roots of the equation $x^4 + Ax^3 + Bx^2 + Cx + D = 0$ such that $\alpha\beta = \gamma\delta = k$ and A,B,C,D are the roots of $x^4 - 2x^3 + 4x^2 + 6x - 21 = 0$ such that $A + B = 0$

The value of $\frac{C}{A}$ is

A. $-\frac{k}{2}$

B. $-k$

C. $\frac{k}{2}$

D. k

Answer: D

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20. If $\alpha, \beta, \gamma, \delta$ are the roots of the equation $x^4 + Ax^3 + Bx^2 + Cx + D = 0$ such that $\alpha\beta = \gamma\delta = k$ and A,B,C,D are the roots of $x^4 - 2x^3 + 4x^2 + 6x - 21 = 0$ such that $A + B = 0$ The value of $(\alpha + \beta)(\gamma + \delta)$ is terms of B and k is

A. $B - 2k$

B. $B - k$

C. $B + k$

D. $B + 2k$

Answer: A

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21. If $\alpha, \beta, \gamma, \delta$ are the roots of the equation $x^4 + Ax^3 + Bx^2 + Cx + D = 0$ such that $\alpha\beta = \gamma\delta = k$ and A,B,C,D are the roots of $x^4 - 2x^3 + 4x^2 + 6x - 21 = 0$ such that $A + B = 0$

The correct statement is

A. $C^2 = AD$

B. $C^2 = A^2D$

C. $C^2 = AD^2$

D. $C^2 = (AD)^2$

Answer: B

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Exercise (Single Integer Answer Type Questions)

1. The sum of all the real roots of the equation $|x - 2|^2 + |x - 2| - 2 = 0$ is

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2. The harmonic mean of the roots of the equation $\left(5+\sqrt{2}\right)x^2-\left(4+\sqrt{5}\right)x+8+2\sqrt{5}=0$ is 2 b. 4 c. 6 d. 8

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3. If product of the real roots of the equation, $x^2-ax+30=2\sqrt{\left(x^2-ax+45\right)}, a>0$ is λ minimum value of sum of roots of the equation is μ. The value of $\left(\mu\right)$ (where (.) denotes the least integer function) is

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4. The minimum value of $\dfrac{\left(x+\frac{1}{x}\right)^6-\left(x^6+\frac{1}{x^6}\right)-2}{\left(x+\frac{1}{x}\right)^3+x^3+\frac{1}{x^3}}$ is (for x>o)

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5. Let a, b, c, d be distinct real numbers and a and b are the roots of the quadratic equation $x^2 - 2cx - 5d = 0$. If c and d are the roots of the quadratic equation $x^2 - 2ax - 5b = 0$ then find the numerical value of $a + b + c + d$

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6. If the maximum and minimum values of $y = \frac{x^2 - 3x + c}{x^2 + 3x + c}$ are 7 and $\frac{1}{7}$ respectively then the value of c is equal to (A) 3 (B) 4 (C) 5 (D) 6

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7. The number of solutions of the equation $\sqrt{x^2} - \sqrt{(x-1)^2} + \sqrt{(x-2)^2} = \sqrt{5}$ is

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8. If α and β are the complex roots of the equation $(1+i)x^2+(1-i)x-2i=o$ where $i=\sqrt{-1}$, the value of $|\alpha-\beta|^2$ is

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9. If α, β be the roots of $4x^8-16x+c=0, c \in R$ such that $1<\alpha<2$ and $2<\beta<3$, then the number of integral values of c is

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10. Let r, s and t be the roots of the equation $8x^3+1001x+2008=0$ and if $99\lambda=(r+s)^3+(s+t)^3+(t+r)^3$, the value of $[\lambda]$ is (where [.] denotes the greatest integer function)

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Exercise (Matching Type Questions)

1. Column I contains rational algebraic expressions and Column II contains possible integers which lie in their ragne. Match the entries of Column I with one or more entries of the elements of Column II.

	Column I		Column II
(A)	$y = \frac{x^2 - 2x + 4}{x^2 + 2x + 4}, x \in R$	(p)	-2
(B)	$y = \frac{2x^2 + 4x + 1}{x^2 + 4x + 2}, x \in R$	(q)	-1
(C)	$y = \frac{x^2 - 3x + 4}{x - 3}, x \in R$	(r)	2
		(s)	3
		(t)	8

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2. Column I contains rational algebraic expressions and Column II contains possible integers of a.

	Column I		Column II
(A)	The equation $x^3 - 6x^2 + 9x + \lambda = 0$ have exactly one root is (1, 3), then $\|[\lambda + 1]\|$ is (where $[\cdot]$ denotes the greatest integer function)	(p)	0
(B)	If $-3 < \dfrac{x^2 - \lambda x - 2}{x^2 + x + 1} < 2, \forall x \in R$, then $\|[\lambda]\|$ is (where $[\cdot]$ denotes the greatest integer function)	(q)	1
(C)	If $x^2 + \lambda x + 1 = 0$ and $(b-c)x^2 + (c-a)x + (a-b) = 0$ have both the roots common, then $\|[\lambda - 1]\|$, (where $[\cdot]$ denotes the greatest integer function)	(r)	2
		(s)	3

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MATCH TYPE

	Column I		Column II
(A)	If a, b, c, d are four non-zero real numbers such that $(d+a-b)^2+(d+b-c)^2=0$ and the roots of the equation $a(b-c)x^2+b(c-a)x+c(a-b)=0$ are real and equal, then	(p)	$a+b+c=0$
(B)	If the equation $ax^2+bx+c=0$ and $x^3-3x^2+3x-1=0$ have a common real root, then	(q)	a, b, c are in AP
(C)	Let a, b, c be positive real numbers such that the expression $bx^2+(\sqrt{(a+c)^2+4b^2})x+(a+c)$ is non-negative, $\forall x \in R$, then	(r)	a, b, c are in GP
		(s)	a, b, c are in HP

1.

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2. Column I contains rational algebraic expressions and Column II contains possible integers of a.

	Column I		Column II
(A)	$y=\frac{ax^2+3x-4}{3x-4x^2+a}, x \in R$ and $y \in R$	(p)	0
(B)	$y=\frac{ax^2+x-2}{a+x-2x^2}, x \in R$ and $y \in R$	(q)	1
(C)	$y=\frac{x^2+2x+a}{x^2+4x+3a}, x \in R$ and $y \in R$	(r)	3
		(s)	5
		(t)	7

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Exercise (Statement I And Ii Type Questions)

1. Statement -1 If the equation $(4p-3)x^2+(4q-3)x+r=0$ is satisfied by $x=a, x=b$ nad $x=c$ (where a,b,c are distinct) then $p=q=\frac{3}{4}$ and $r=0$

Statement -2 If the quadratic equation $ax^2+bx+c=0$ has three distinct roots, then a, b and c are must be zero.

A. Statement -1 is true, Statement -2 is true, Statement -2 is a correct explanation for Statement-1

B. Statement -1 is true, Statement -2 is true, Statement -2 is not a correct explanation for Statement -1

C. Statement -1 is true, Statement -2 is false

D. Statement -1 is false, Statement -2 is true

Answer: D

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2. Statement -1 The equation

$x^2+(2m+1)x+(2n+1)=0$ where $m, n\varepsilon I$ canot have any rational roots.

Statement -2 The quantity $(2m+1)^2-4(2n+1)$, where $m, n\varepsilon I$ can never be perfect square.

A. Statement -1 is true, Statement -2 is true, Statement -2 is a correct explanation for Statement-1

B. Statement -1 is true, Statement -2 is true, Statement -2 is not a correct explanation for Statement -1

C. Statement -1 is true, Statement -2 is false

D. Statement -1 is false, Statement -2 is true

Answer: A

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3. Statement -1 In the equation $ax^2 + 3x + 5 = 0$, if one root is reciprocal of the other, then a is equal to 5.

Statement -2 Product of the roots is 1.

A. Statement -1 is true, Statement -2 is true, Statement -2 is a correct explanation for Statement-1

B. Statement -1 is true, Statement -2 is true, Statement -2 is not a correct explanation for Statement -1

C. Statement -1 is true, Statement -2 is false

D. Statement -1 is false, Statement -2 is true

Answer: A

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4. Statement 1 If one root of $Ax^3 + Bx^2 + Cx + D = 0 A \neq 0$, is the arithmetic mean of the other two roots, then the relation $2B^3 + k_1 ABC + k_2 A^2 D = 0$ holds good and then $(k_2 - k_1)$ is a perfect square.

Statement -2 If a,b,c are in AP then b is the arithmetic mean of a and c.

A. Statement -1 is true, Statement -2 is true, Statement -2 is a correct explanation for Statement-1

B. Statement -1 is true, Statement -2 is true, Statement -2 is not a correct explanation for Statement -1

C. Statement -1 is true, Statement -2 is false

D. Statement -1 is false, Statement -2 is true

Answer: A

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5. Statement -1 If x, y, z be real variables satisfying $x+y+z=6$ and $xy+yz+z=8$, the range of variables x,y and z are identical.

Statement -2 $x+y+z=6$ and $xy+yz+zx=8$ remains same if x, y, z interchange their positions.

A. Statement -1 is true, Statement -2 is true, Statement -2 is a correct explanation for Statement-1

B. Statement -1 is true, Statement -2 is true, Statement -2 is not a correct explanation for Statement -1

C. Statement -1 is true, Statement -2 is false

D. Statement -1 is false, Statement -2 is true

Answer: A

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6. Statement -1 $ax^3 + bx + c = 0$ where $a, b, c \varepsilon R$ cannot have 3 non-negative real roots.

Statement 2 Sum of roots is equal to zero.

A. Statement -1 is true, Statement -2 is true, Statement -2 is a correct explanation for Statement-1

B. Statement -1 is true, Statement -2 is true, Statement -2 is not a correct explanation for Statement -1

C. Statement -1 is true, Statement -2 is false

D. Statement -1 is false, Statement -2 is true

Answer: A

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7. Statement -1 The quadratic polynomial $y = ax^2 + bx + c(a \neq 0$ and $a, b, \varepsilon R)$ is symmetric about the line $2ax + b = 0$

Statemtn 2 Parabola is symmetric about its axis of symmetry.

A. Statement -1 is true, Statement -2 is true, Statement -2 is a correct explanation for Statement-1

B. Statement -1 is true, Statement -2 is true, Statement -2 is not a correct explanation for Statement -1

C. Statement -1 is true, Statement -2 is false

D. Statement -1 is false, Statement -2 is true

Answer: A

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Exercise (Subjective Type Questions)

1. For what values o m the equation $(1+m)x^2 - 2(1+3m)x + (1+8m) = 0$ has $(m \varepsilon R)$

(i) both roots are imaginary?

(ii) both roots are equal?

(iii) both roots are real and distinct?

(iv) both roots are positive?

(v) both roots are negative?

(vi) roots are opposite in sign?

(vii)roots are equal in magnitude but opposite in sign?

(viii) atleast one root is positive?

(iv) atleast one root is negative?

(x) roots are in the ratio $2:3$?

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2. for what values of m, the equation $2x^2, -2(2m+1), x+m(m+1)=0 m \in R$ has

(i) Both roots smallar than 2 ?

(ii) Both roots greater than 2 ?

(iii) Both roots lie in the interval (2,3) ?

(iv) Exactly one root lie in the interval (2,3) ?

(v) One root is smaller than 1, and the other root is greater than 1 ?

(vi) One root is greater than 3 and the other root is smaller than 2 ?

(vii) Roots α and β are such that both 2 and 3 lie between α and β ?

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3. If r be the ratio ofthe roots of the equation $ax^2+bx+c=0$, show that $\frac{(r+1)^2}{r}=\frac{b^2}{ac}$

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4. if the roots of the equation $\frac{1}{x+p}+\frac{1}{x+q}=\frac{1}{r}$ are equal in magnitude but opposite in sign, show that p+q = 2r & that the product of roots is equal to $\left(-\frac{1}{2}\right)\left(p^2+q^2\right)$.

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5. If one root of the equation $ax^2+bx+c=0$ is equal to then^{th} power of the other, then $(ac^n)^{\frac{1}{n+1}}+(a^nc)^{\frac{1}{n+1}}+b$ is equal to

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6. If α, β be the roots of the equation $ax^2+bx+c=0$ and γ, δ those of equation $lx^2+mx+n=0$,then find the equation whose roots are $\alpha\gamma+\beta\delta$ and $\alpha\delta+\beta\gamma$

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7. Show that the roots of the equation $(a^2 - bc)x^2 + 2(b^2 - ac)x + c^2 - ab = 0$ are equal if either $b = 0$ or $a^3 + b^3 + c^3 - 3acb = 0$

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8. If the equation $x^2 - px + q = 0$ and $x^2 - ax + b = 0$ have a comon root and the other root of the second equation is the reciprocal of the other root of the first, then prove that $(q - b)^2 = bq(p - a)^2$.

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9. If the equation $x^2 - 2px + q = 0$ has two equal roots, then the equation $(1 + y)x^2 - 2(p + y)x + (q + y) = 0$ will have its roots real and distinct only, when y is negative and p is not unity.

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10. Solve the equation $x^{\log_x (x+3)^2} = 16.$

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11. Solve the equation $(2+\sqrt{3})^{x^2-2x+1} + (2-\sqrt{3})^{x^2-2x-1} = \frac{101}{10(2-\sqrt{3})}$

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12. Solve the equation $x^2 + \left(\frac{x}{x-1}\right)^2 = 8$

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13. Find number of solutions of the equation $\sqrt{(x+8)+2\sqrt{x+7}} + \sqrt{(x+1)-\sqrt{x+7}} = 4$

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14. Find all values of a for which the inequation $4^{x^2} + 2(a+1)2^{x^2} + 4a^2 - 3 > 0$ is satisfied for any x.

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15. Solve the inequation $\log_{x^2+2x-3}\left(\frac{|x+4|-|x|}{x-1}\right| > 0$

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16. Solve the system $\left|x^2 - 2x\right| + y = 1, x^2 + |y| = 1$

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17. If α, β, γ are the roots of the cubic $x^3 - px^2 + qx - r = 0$

Find the equations whose roots are

(i) $\beta\gamma + \frac{1}{\alpha}, \gamma\alpha + \frac{1}{\beta}, \alpha\beta + \frac{1}{\gamma}$

(ii)$(\beta+\gamma-\alpha), (\gamma+\alpha-\beta), (\alpha+\beta-\gamma)$

Also find the valueof $(\beta+\gamma-\alpha)(\gamma+\alpha-\beta)(\alpha+\beta-\gamma)$

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18. If $A_1, A_2, A_3, \ldots\ldots\ldots\ldots\ldots\ldots, A_n, a_1, a_2, a_3, \ldots\ldots a_n, a, b, c \varepsilon R$

show that the roots of the equation

$$\frac{A_1^2}{x-a_1}+\frac{A_2^2}{x-a_2}+\frac{A_3^2}{x-a_3}+\ldots+\frac{A_n^2}{x-a_n}$$
$=ab^2+c^2x+ac$are real.

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19. For what values of the parameter a the equation

$x^4+2ax^3+x^2+2ax+1=0$ has atleast two distinct negative roots?

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20. If $[x]$ is the integral part of a real number x. Then solve $[2x] - [x+1] = 2x$

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21. Prove that for any value of a, the inequatiion $(a^2+3)x^2 + (a+2)x - 6 < 0$ is true for atleast one negative x.

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22. How many real solutions of the equation $6x^2 - 77[x] + 147 = 0$, where $[x]$ is the integral part of x?

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23. If α, β are the roots of the equation $x^2 - 2x - a^2 + 1 = 0$ and γ, δ are the roots of the equation

$x^2 - 2(a+1)x + a(a-1) = 0$ such that $\alpha, \beta \varepsilon n(\gamma, \delta)$ find the value of a.

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24. If the equation $x^4 + px^3 + qx^2 + rx + 5 = 0$ has four positive real roots, find the maximum value of pr.

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Exercise (Questions Asked In Previous 13 Years Exam)

1. In the quadratic equation $ax^2 + bx + c = 0$. if $\delta = b^2 - 4ac$ and $\alpha + \beta, \alpha^2 + \beta^2, \alpha^3 + \beta^3$ and α, β are the roots of $ax^2 + bx + c = 0$

A. $\Delta \neq 0$

B. $b\Delta = 0$

C. $cb \neq 0$

D. $c\Delta = 0$

Answer: D

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2. Let S denote the set of all polynomials $P(x)$ of degree ≤ 2 such that $P(1) = 1, P(0) = 0 and P'(x) > 0 \forall x \in [0, 1]$, then $S = \varphi$ b. `S={(1-a)x^2+a x ;0

A. $S = 0$

B. $S = ax + (1-a)x^2, \forall a \varepsilon (0, \infty)$

C. $S = ax + (1-a)x^2, \forall a \varepsilon R$

D. $S = ax + (1-a)x^2, \forall a \varepsilon (0, 2)$

Answer: D

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3. If the roots of $x^2 - bx + c = 0$ are two consecutive integers, then $b^2 - 4c$ is 0 (b) 1 (c) 2 (d) none of these

A. 1

B. 2

C. 3

D. 4

Answer: A

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4. If the equation $a_n x^n + a_{n-1} x^{n-1} + .. + a_1 x = 0, a_1 \neq 0, n \geq 2,$ has a positive root $x = \alpha$ then the equation $n a_n x^{n-1} + (n-1) a_{n-1} x^{n-2} + ... + a_1 = 0$ has a positive root which is

A. greater than or equal to α

B. equal to α

C. greater than α

D. smaller than α

Answer: D

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5. If both the roots of the quadratic equation $x^2 - 2kx + k^2 + k - 5 = 0$ are less than 5 , then k lies in the interval

A. $(-\infty, 4)$

B. $[4, 5]$

C. $(5, 6)$

D. $(6, \infty)$

Answer: A

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6. Let $a and b$ be the roots of the equation $x^2 - 10cx - 11d = 0$ and those of $x^2 - 10ax - 11b = 0 are c, ..$ then find the value of $a + b + c + \ddot{w} hen a \ne b \ne c \ne ..$

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7. Let a, b, c be the sides of a triangle. No two of them are equal 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) $\lambda \in \left(\frac{1}{5}, \frac{5}{3}\right)$ (d) $\lambda \in \left(\frac{4}{3}, \frac{5}{3}\right)$

A. $\lambda < \frac{4}{3}$

B. $\lambda < \frac{5}{3}$.

C. $l\varepsilon\left(\frac{1}{3}, \frac{5}{3}\right)$

D. $\lambda\varepsilon\left(\frac{4}{3}, \frac{5}{3}\right)$

Answer: A

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8. All the values of m for whilch both the roots of the equation $x^2 - 2mx + m^2 - 1 = 0$ are greater than -2 but less than 4 lie in the interval `-23c. -1

A. $-2 < m < 0$

B. $m > 3$

C. $-1 < m < 3$

D. $1 < m < 4$

Answer: C

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9. If the roots of the quadratic equation $x^2 + px + q = 0$ are $\tan 30^0 andtan15^0$, respectively, then find the value of $2 + q - p$.

A. 2

B. 3

C. 0

D. 1

Answer: B

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10. Let α, β be the roots of the equation $x^2 - px + r = 0$ and $\frac{\alpha}{2}, 2\beta$ be the roots of the equation $x^2 - qx + r = 0$, the value of r is (2007, 3M) $\frac{2}{9}(p-q)(2q-p)$ (b) $\frac{2}{9}(q-p(2p-q)$ $\frac{2}{9}(q-2p)(2q-p)$ (d) $\frac{2}{9}(2p-q)(2q-p)$

A. $\frac{2}{9}(p-q)(2q-p)$

B. $\frac{2}{9}(q-p)(2p-q)$

C. $\frac{2}{9}(q-2p)(2q-p)$

D. $\frac{2}{9}(2p-q)(2q-p)$

Answer: D

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

A. $(-3, 3)$

B. $(-3, \infty)$

C. $(3, \infty)$

D. $(-\infty, -3)$

Answer: A

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12. 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 $\alpha, \dfrac{1}{\beta}$ are the roots of the equation

$ax^2 + 2bx + c = 0,$ where $\beta \notin \{-1, 0, 1\}.$ Statement I $(p^2 - q)(b^2 - ac) \geq 0$ Statement 11 $b \notin pa$ or $c \notin qa.$

A. Statement -1 is true, Statement -2 is true, Statement -2 is a correct explanation for Statement-1

B. Statement -1 is true, Statement -2 is true, Statement -2 is not a correct explanation for Statement -1

C. Statement -1 is true, Statement -2 is false

D. Statement -1 is false, Statement -2 is true

Answer: B

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13. The quadratic equations $x^2 6x + a = 0 and x^2 cx + 6 = 0$ have one root in common. The other roots of the first and second equations are integers in the ratio 4 : 3. Then the common root is (1) 1 (2) 4 (3) 3 (4) 2

A. 4

B. 3

C. 2

D. 1

Answer: C

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

A. 1

B. 3

C. 5

D. 7

Answer: A

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15. Suppose the cubic $x^3 - px + q$ has three distinct real roots, where $p > 0$ and $q > 0$. Then which one of the following holds?

A. The cubic has minima at $\left(-\sqrt{\frac{p}{3}}\right)$ and maxima at $\sqrt{\frac{p}{3}}$

B. The cubic has minima at both $\sqrt{\frac{p}{3}}$ and $\left(-\sqrt{\frac{p}{3}}\right)$

C. The cubic has maxima at both $\sqrt{\frac{p}{3}}$ and $\left(-\sqrt{\frac{p}{3}}\right)$

D. The cubic has minima at $\sqrt{\frac{p}{3}}$ and maxima at $\left(-\sqrt{\frac{p}{3}}\right)$

Answer: C

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16. The smallest value of k, for which both the roots of the equation, $x^2 - 8kx + 16(k^2 - k + 1) = 0$ are real, distinct and have values at least 4, is

A. 6

B. 4

C. 2

D. 0

Answer: D

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17. If the roots of the equation $bx^2 + cx + a = 0$ be imaginary, then for all real values of x, the expression $3b^2x^2 + 6bcx + 2c^2$ is (1) greater than 4ab (2) less than 4ab (3) greater than $4ab$ (4) less than $4ab$

A. less than $(-4ba)$

B. greater than $4ab$

C. less than $4ab$

D. greater than $(-4ab)$

Answer: B

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18. Q. Let p and q real number such that $p \neq 0, p^2 \neq q$ and $p^2 \neq -q$. if α and β are non-zero complex number satisfying $\alpha + \beta = -p$ and $\alpha^3 + \beta^3 = q$, then a quadratic equation having $\frac{\alpha}{\beta}$ and $\frac{\beta}{\alpha}$ 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. $(p^3 - q)x^2(5p^3 + 2q)x + (p^3 - q) = 0$

Answer: C

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19. Conder the function $f(x) = 1 + 2x + 3x^2 + 4x^3$

Let the sum of all distinct real roots ot f (x) and let t= |s| The function f(x) is

A. $\left(-\frac{1}{4}, 0\right)$

B. $\left(-11, \frac{3}{4}\right)$

C. $\left(-\frac{3}{4}, -\frac{1}{2}\right)$

D. $\left(0, \frac{1}{4}\right)$

Answer: C

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20. Let α and β be the roots of $x^2 - 6x - 2 = 0$ with $\alpha > \beta$ if $a_n = \alpha^n - \beta^n$ for $n \geq 1$ then the value of $\frac{a_{10} - 2a_8}{2a_9}$

A. 1

B. 2

C. 3

D. 4

Answer: B

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21. The value of b for which the equation $x^2 + bx - 1 = 0$ and $x^2 + x + b = 0$ have one root in common is (a) $-\sqrt{2}$ (b) $-i\sqrt{3}$ (c) $i\sqrt{5}$ (d) $\sqrt{2}$

A. $-\sqrt{2}$

B. $-i\sqrt{3}, i = \sqrt{-1}$

C. $i\sqrt{5}, i = \sqrt{-1}$

D. $\sqrt{2}$

Answer: B

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22. The number of distinct real roots of $x^4 - 4x^3 + 12x^2 + x - 1 = 0$ is

:

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23. Let for $a \neq a_1 \neq 0$, $f(x) = ax^2 + bx + c$,$g(x) = a_1x^2 + b_1x + c_1$ and $p(x) = f(x) - g(x)$. If $p(x) = 0$ only for $x = -1$ and $p(-2) = 2$ then the value of $p(2)$.

A. 18

B. 3

C. 9

D. 6

Answer: B

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24. 8. Sachin and Rahul attempted to solve a quadratic equation. Sachin made a mistake in writing down the constant term and ended up in roots (4,3). Rahul made a mistake in writing down coefficient of x to get roots (3, 2). The correct roots of equation are:

A. $-4, -3$

B. $6, 1$

C. $4, 3$

D. $-6, -1$

Answer: B

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25. let $\alpha(a)$ and $\beta(a)$ be the roots of the equation $\left((1+a)^{\frac{1}{3}}-1\right)x^2+\left((1+a)^{\frac{1}{2}}-1\right)x+\left((1+a)^{\frac{1}{6}}-1\right)=0$ where $a > -1$ then, $\lim_{a \to 0^+} \alpha(a)$ and $\lim_{a \to 0^+} \beta(a)$

A. $\left(-\frac{5}{2}\right)$ and 1

B. $\left(-\frac{1}{2}\right)$ and (1)

C. $\left(-\frac{7}{2}\right)$ and 2

D. $\left(-\frac{9}{2}\right)$ and 3

Answer: D

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

A. exactly one real root

B. exactly one real root

C. exactly four real roots

D. infinite number of real roots

Answer: D

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27. If the equation $x^2 + 2x + 3 = 0$ and $ax^2 + bx + c = 0$ have a common root then $a : b : c$ is

A. $3:2:1$

B. $1:3:2$

C. $3:1:2$

D. $1:2:3$

Answer: C

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28. If $a \in R$ and the equation $-3(x-[x])^2+2(x-[x])+a^2=0$ (where [x] denotes the greatest integer x) has no integral solution, then all possible values of a lie in the interval (1) $(-1, 0) \cup (0, 1)$ (2) (1, 2) (3) $(-2, -1)$ (4) $(-\infty, -2) \cup (2, \infty)$

A. $(-2, -1)$

B. $(-\infty, -2) \cup (2, \infty)$

C. $(-1, 0) \cup (0, 1)$

D. $(1, 2)$

Answer: B

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29. Let α and β be the roots of equation $px^2 + qx + r = 0, p \neq 0$.If p, q, r are in A.P. and $\frac{1}{\alpha} + \frac{1}{\beta} = 4$, then the value of $|\alpha - \beta|$ is :

A. $\frac{\sqrt{34}}{9}$

B. $\frac{2\sqrt{13}}{9}$

C. $\frac{\sqrt{61}}{9}$

D. $\frac{2\sqrt{17}}{9}$

Answer: B::D

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30. Let a $\in R$ and let f: $R \rightarrow R$ be given by f(x) $= x^5 - 5x + a.$ then

A. $f(x)$ has three real roots if $a > 4$

B. $f(x)$ has only one real root fi $a > 4$

C. $f(x)$ has three real roots if $alg - 4$

D. $f(x)$ has three real roots, if $-4 < a < 4$

Answer: D

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31. The quadratic equation $p(x) = 0$ with real coefficients has purely imaginary roots. Then the equation $p(p(x)) = 0$ has only purely imaginary roots at real roots two real and purely imaginary roots neither real nor purely imaginary roots

A. only purely imaginary roots

B. all real roots

C. two real and two purely imaginary roots

D. neither real nor purely imaginary roots

Answer: A::D

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32. Let S be the set of all non-zero numbers αsuch 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 of S?

A. $\left(-\frac{1}{2}, -\frac{1}{\sqrt{5}}\right)$

B. $\left(-\frac{1}{\sqrt{5}}, 0\right)$

C. $\left(0, \frac{1}{\sqrt{5}}\right)$

D. $\left(\frac{1}{\sqrt{5}}, \frac{1}{2}\right)$

Answer: C

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33. The sum of all real values of X satisfying the equation $(x^2 - 5x + 5)^{x^2 + 4x - 60} = 1$ is:

A. 6

B. 5

C. 3

D. -4

Answer: C

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34. Let $-\frac{1}{6} < \theta < -\frac{\pi}{12}$ Suppose α_1 and β_1, are the roots of the equation $x^2 - 2x\sec\theta + 1 = 0$ and α_2 and β_2 are the roots of the equation $x^2 + 2x\tan\theta - 1 = 0$. If $\alpha_1 > \beta_1$ and $\alpha_2 > \beta_2$, then $\alpha_1 + \beta_2$ equals

A. $2(\sec\theta - \tan\theta)$

B. $2 \sec \theta$

C. $-2 \tan \theta$

D. 0

Answer: A

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35. If, for a positive integer n, the quadratic equation, $x(x+1)+(x+1)(x+2)+\ldots . .+(x+\overline{n-1})(x+n)=10n$ has two consecutive integral solutions, then n is equal to

A. 11

B. 12

C. 9

D. 10

Answer: A

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