MATHS

BOOKS - OBJECTIVE RD SHARMA ENGLISH

QUADRATIC EXPRESSIONS AND EQUATIONS

Illustration

1. $If a, b, c, d \in R$ such that $a < b < c < d,$ then roots of the equation

$(x-a)(x-c)+2(x-b)(x-d)=0$

A. are imaginary

B. are equal

C. are real and distinct lying between a and b

D. real and distinct lying between a and d.

Answer: D

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2. If $6, 8 \text{ and } 12$ are $l^{th}, m^{th} \text{ and } n^{th}$ terms of an $A.P. \text{ and } f(x) = nx^2 + 2lx - 2m$, then the equation $f(x) = 0$ has -

A. both roots negative

B. both roots greater than 2

C. one root negative other greater than 1

D. exactly one root in (0, 1).

Answer: D

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3. Find the harmonic mean of the roots of the equation $(5+\sqrt{2})x^2 - (4+\sqrt{5})x + (8+2\sqrt{5}) = 0$

A. 2

B. 4

C. 7

D. 8

Answer: B

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4. If α, β are roots of the equation$x^2 - p(x+1) - c = 0$ show that $(\alpha+1)(\beta+1) = 1 - c$ Hence prove that $\frac{\alpha^2 + 2\alpha + 1}{\alpha^2 + 2\alpha + c} + \frac{\beta^2 + 2\beta + 1}{\beta^2 + 2\beta + c} = 1$

A. 1

B. 2

C. 3

D. 0

Answer: A

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5. If the roots of the equation $\frac{1}{x+p}+\frac{1}{x+q}=\frac{1}{r}$ are equal in magnitude and opposite in sign, then

(A) p+q=r

(B)p+q=2r

(C) product of roots=$-\frac{1}{2}(p^2+q^2)$

(D) sum of roots=1

A. $-\frac{1}{2}(p^2-q^2)$

B. p^2+q^2

C. $\frac{1}{2}(p^2-q^2)$

D. $-\frac{1}{2}(p^2+q^2)$

Answer: D

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6. 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

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7. Let α and β be the roots of $x^2 - 6x - 2 = 0$, with $\alpha > \beta$. If $\alpha_n = a^n - \beta^n$ for $a \neq 1$, then the values of $\frac{a_{10} - 2a_8}{2a_9}$ is

A. 3

B. -3

C. 6

D. -6

Answer: A

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8. If $\alpha . \beta$ are the roots of $x^2 + bx + c = 0$ and $\alpha + h, \beta + h$ are the roots of $x^2 + qx + r = 0$ then $2h =$

A. b+q

B. b-q

C. $\frac{b+q}{2}$

D. 0

Answer: B

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

A. $(3, \infty)$

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

C. $(-3, 3)$

D. $(-3, \infty)$

Answer: C

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

A. 2

B. 3

C. 0

D. 1

Answer: D

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11. If, for a positive integer n, the quadratic equation, $x(x+1)+(x-1)(x+2)+\ +(x+n-1)(x+n)=10n$ has two consecutive integral solutions, then n is equal to : $(1)10$ (2) 11 (3) 12 (4) 9

A. 2

B. 3

C. 0

D. 11

Answer: D

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12. If $\tan A$ and $\tan B$ are the roots of $x^2 - px + q = 0$, then the value of$\sin^2(A + B)$ is

A. $\frac{p^2}{p^2 + (1 + q)^2}$

B. $\frac{p^2}{p^2 + q^2}$

C. $\frac{q^2}{p^2 + (1 - q)^2}$

D. $\frac{p^2}{(p + q)^2}$

Answer: A

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13. A triangle $PQR, \angle R = 90^\circ$ and $\tan\left(\frac{P}{2}\right)$ and $\tan\left(\frac{Q}{2}\right)$ roots of the $ax^2 + bx + c = 0$ then prove that $a + b = c$

A. a+b = c

B. b+c = 0

C. a+c = b

D. b = c

Answer: A

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14. 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 $1/3$ b. 1 c. 3 d. $2/3$

A. $\frac{1}{3}$

B. 1

C. 3

D. $2/3$

Answer: C

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15. Let p, q be integers and let α, β be the roots of the equation $x^2 - 2x + 3 = 0$ where $\alpha \neq \beta$ For $n = 0, 1, 2, \ldots\ldots,$ Let $\alpha_n = p\alpha^n + q\beta^n$ value $\alpha_9 =$

A. $a_n + 1 = a_n + a_n - 1$

B. $a_n + 2 = a_n + 1 + a_n - 1$

C. $a_n + 1 = a_n + 1$

D. $a_n + 1 = a_n - 1 + 1$

Answer: A

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16. $a_n = p(\alpha^n) + q(\beta^n)$where $\alpha = \dfrac{1+\sqrt{5}}{2}$ and $\beta = \dfrac{1-\sqrt{5}}{2}$, also $a_{n+1} = a_n + a_{n-1}$. If $a_4 = 28, \text{then} p + 2q =$

A. 21

B. 11

C. 7

D. 12

Answer: D

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

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: D

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18. Let a be a non-zero real number and α, β be the roots of the equation $ax^2 + 5x + 2 = 0$. Then the absolute value of the difference of the roots of the equation $a^3(x+5)^2 - 25a(x+5) + 50 = 0$, is

A. $\left|\alpha^2 - \beta^2\right|$

B. $\left|\alpha\beta\left(\alpha^2 - \beta^2\right)\right|$

C. $\left|\dfrac{\alpha^2 - \beta^2}{\alpha\beta}\right|$

D. $\left|\dfrac{\alpha^2 - \beta^2}{\alpha^2\beta^2}\right|$

Answer: A

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

A. 4

B. 2

C. 0

D. none of these

Answer: B

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20. Let p, q, r $\in$ R and $r > p > 0$. If the quadratic equation $px^2 + qx + r = 0$ has two complex roots α and β, then $|\alpha| + |\beta|$, is

A. less than 2 but not equal to 1

B. equal to 2

C. equal to 1

D. greater than 2

Answer: D

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21. 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: D

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22. If the sum of two roots of the equation $x^3 - px^2 + qx - r = 0$ is zero, then:

A. pq = r

B. qr = p

C. pr = q

D. pqr = 1

Answer: A

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23. If the roots of the equation $x^3 + 3ax^2 + 3bx + c = 0$ are in $H.P.$, then (i) $2b^2 = c(3ab - c)$ (ii) $2b^3 = c(3ab - c)$ (iii) $2b^3 = c^2(3ab - c)$ (iv) $2b^2 = c^2(3ab - c)$

A. $\beta = \frac{1}{\alpha}$

B. $\beta = b$

C. $\beta = -\frac{c}{b}$

D. $\beta = \frac{b}{c}$

Answer: C

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24. If the roots of the equation $x^3 - px^2 + qx - r = 0$ are in A.P., then

A. $2p^3 = 9pq - 27r$

B. $2q^3 = 9pq - 27r$

C. $p^3 = 9pq - 27r$

D. $2p^3 = 9pq + 27r$

Answer: A

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25. If $x^2 + x + 1$ is a factor of $ax^3 + bx^2 + cx + d$ the real root of $ax^3 + bx^2 + cx + d = 0$ is

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

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

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

D. $-\frac{c}{a}$

Answer: B

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26. If two roots of the equation $x^3 - px^2 + qx - r = 0$ are equal in magnitude but opposite in sign, then:

A. r = pq

B. $r = 2p^3 + pq$

C. $r = p^2q$

D. none of these

Answer: A

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27. If $x^3 + 3x^2 - 9x + \lambda$ is of the form $(x - \alpha)^2(x - \beta)$ then λ is equal to

A. -5

B. 27

C. -27

D. 0

Answer: C

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28. Let α, β, γ be the roots of the equation $8x^3 + 1001x + 2008 = 0$ then the value $(\alpha + \beta)^3 + (\beta + \gamma)^3 + (\gamma + \alpha)^3$ is

A. 251

B. 751

C. 735

D. 753

Answer: D

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29. The real roots of the equation $|x|^3 - 3x^2 + 3|x| - 2 = 0$

A. 1

B. 2

C. 3

D. none of these

Answer: B

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30. The equation $x^3 - 6x^2 + 15x + 3 = 0$ has

A. only one positive root

B. two positive and one negative roots

C. no positive root

D. none of these

Answer: C

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31. The quadratic equation whose roots are reciprocal of the roots of the equation $ax^2 + bx + c = 0$ 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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32. Let Δ^2 be the discriminant and α, β be the roots of the equation $ax^2 + bx + c = 0$ then $2a\alpha + \Delta$ and $2a\beta - \Delta$ can be roots of the equation.

A. $x^2 + 2bx + b^2 = 0$

B. $x^2 - 2bx + b^2 = 0$

C. $x^2 + 2bx - 3b^2 - 16ac = 0$

D. $x^2 - 2bx - 3b^2 + 16ac = 0$

Answer: A

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33. If A, G & H are respectively the A.M., G.M. & H.M. of three positive numbers a, b, & c, then equation whose roots are a, b, & c is given by

A. $x^3 - 3Ax^2 + \frac{3G^3}{H}x - G^3 = 0$

B. $x^3 + 3Ax^2 + \frac{3G^3}{H}x - G^3 = 0$

C. $x^3 + Ax^2 + \frac{G^3}{H} - G^3 = 0$

D. $x^3 - 3Ax^2 - \frac{3G^3}{H}x - G^3 = 0$

Answer: A

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34. If $\alpha, \beta, \gamma, \sigma$ are the roots of the equation $x^4 + 4x^3 - 6x^2 + 7x - 9 = 0,$ then the value of

$\left(1+\alpha^2\right)\left(1+\beta^2\right)\left(1+\gamma^2\right)\left(1+\sigma^2\right)$ is a. 9 b. 11 c. 13 d. 5

A. 5

B. 9

C. 11

D. 13

Answer: D

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35. The quadratic equation whose roots are reciprocal of the roots of the equation $ax^2+bx+c=0$ is :

A. $cx^2+bx+a=0$

B. $bx^2+cx+a=0$

C. $cx^2+ax+b=0$

D. $bx^2+ax+c=0$

Answer: A

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36. If the roots of the equation $x^3 - px^2 + qx - r = 0$ are in A.P., then

A. $27r^2 + 9pqr + 2q^3 = 0$

B. $27r^2 - 9pqr + 2q^3 = 0$

C. $2r^2 - 9pqr + 27q^3 = 0$

D. $27r^2 - 9pqr - 2q^3 = 0$

Answer: B

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37. If the roots of the equation $x^2 - 4x - \log_3 a = 0$, are real , the least value of a is :

A. 81

B. $1/81$

C. $1/64$

D. none of these

Answer: B

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38. If the equation $(3x)^2 + \left(27 \times 3^{1/p} - 15\right)x + 4 = 0$ has equal roots, then p =

A. 0

B. 2

C. $-1/2$

D. none of these

Answer: C

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39. IF the roots of the equation $ax^2 + bx + c = 0$ are real and distinct , then

A. both roots are greater than $\frac{-b}{2a}$

B. both roots are less than $\frac{-b}{2a}$

C. one of the roots exceeds $\frac{-1}{2a}$

D. none of these

Answer: C

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40. If the roots of the equation $(x-b)(x-c)+(x-c)(x-a)+(x-a)(x-b)=0$ are equal then

A. a + b + c = 0

B. $a + b\omega + c\omega^2 = 0$

C. a - b + c = 0

D. none of these

Answer: B

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41. If a,b,c are positive real numbers, then the number of positive real roots of the equation $ax^2 + bx + c = 0$ is

A. are real and positive

B. real and negative

C. have negative real part

D. have positive real part.

Answer: C

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42. If a,b,c are real, then both the roots of the equation (x-b)(x-c)+(x-c)(x-a)+(x-a)(x-b)=0 are always (A) positive (B) negative (C) real (D) imaginary.

A. positive

B. negative

C. real

D. none of these

Answer: C

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43. If p, q are real $p \neq q$, then show that the roots of the equation $(p-q)x^2+5(p+q)x-2(p-q)=0$ are real and unequal.

A. real and equal

B. unequal and rational

C. unequal and irrational

D. nothing can be said

Answer: D

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44. The polynomial $(ax^2 + bx + c)(ax^2 - dx - c)$, $ac \neq 0$, has :

A. our real roots

B. at least two real roots

C. at most two real roots

D. No real roots

Answer: B

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45. If the product of the roots of the equation $x^2 - 2\sqrt{2}kx + 2e^{2\log k} - 1 = 0$ is 31, then the roots of the equation are real for k equal to

A. 1

B. 2

C. 3

D. 4

Answer: D

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46. If the roots α, β of the equatin $px^2 + qx + r = 0$ are real and of opposite sign (where p,q,r are real coefficient), then the roots of the equation $\alpha(x - \beta)^2 + \beta(x - \alpha)^2 = 0$ are :

A. positive

B. negative

C. real and of opposite sign

D. Imaginary

Answer: C

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47. The number of integral values of m for which the equation $(1+m^2)x^2-2(1+3m)x+(1+8m)=0$ has no real root is :

A. 1

B. 2

C. 3

D. infinitely many

Answer: D

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

A. $\frac{9}{4}$

B. $-\frac{9}{4}$

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

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

Answer: B

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49. The minimum value of $2x^2 + x - 1$ is

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

B. $\frac{3}{4}$

C. $-\frac{9}{8}$

D. $\frac{9}{4}$

Answer: C

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50. $a, b, c, \in R, a \neq 0$ and the quadratic equation $ax^2 + bx + c = 0$ has no real roots, then which one of the following is not true?

A. $a + b + c > 0$

B. $a(a + b + c) > 0$

C. $ac(a + b + c) > 0$

D. $c(a + b + c) > 0$

Answer: A

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51. 25. The integer k for which the inequality `x^2-2(4k-1)x +15k^2- 2k-7 > 0 is valid for any real x is

(a) 2

(b) 3

(c) 4

(d) infinite

A. 2

B. 3

C. 4

D. none of these

Answer: B

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52. For all x, x^2+2ax+10-3a>0`, then the interval in which a lies is

A. $a < -5$

B. $-5 < a < 2$

C. $a > 5$

D. $2 < a < 5$

Answer: B

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53. If α, β are the roots of $ax^2 + bx + c = 0$ and $k \in R$ then the condition so that $\alpha < k < \beta$ is :

A. $ak^2 + bk + c < 0$

B. $a^2k^2 + abk + ac < 0$

C. $a^2k^2 + abk + ac > 0$

D. none of these

Answer: B

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54. The values of a for which the equation $2x^2 - 2(2a+1)x + a(a+1) = 0$ may have one root less them a and other root greater than a are given by

A. $1 > a > 0$

B. $-1 < a < 0$

C. $a \geq 0$

D. $a > 0 \text{ or } a < -1$

Answer: D

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55. Find all values of p so that 6 lies between roots of the equation $x^2 + 2(p-3)x + 9 = 0$

A. $a \in [-3/4, \infty)$

B. $a \in (\infty, -3/4)$

C. $a \in (-\infty, 0) \cup (6, \infty)$

D. $a \in (-3/4, 6)$

Answer: B

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56. The set of values of k for which roots of the equation $x^2 - 3x + k = 0$ lie in the interval (0, 2), is

A. $(2, \infty)$

B. $(0, \infty)$

C. $(-\infty, 9/4)$

D. $(2, 9/4]$

Answer: D

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57. The necessary and sufficient condition for the equation $(1 - a^2)x^2 + 2ax - 1 = 0$ to have roots lying in the interval $(0, 1)$ is

A. $a < \frac{1 + \sqrt{5}}{2}$

B. $a > 2$

C. $\frac{1 + \sqrt{5}}{2} < a < 2$

D. $a > \sqrt{2}$

Answer: B

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58. The real number k for which the equation $2x^3 + 3x + k = 0$ has two distinct real roots in [0,1]

A. lies between 1 and 2

B. lies between 2 and 3

C. lies between n - 1 and 0

D. does not exist

Answer: D

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59. Find all values of a for which both roots of the equation $x^2 - 6ax + 2 - 2a + 9a^2 = 0$ are greater then 3.

A. $a > \frac{9}{11}$

B. $a \geq \frac{11}{9}$

C. $a > \frac{11}{9}$

D. $a < \frac{11}{9}$

Answer: C

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60. The values of a for which the roots of the equation $(a+1)x^2 - 3ax + 4a = 0 (a \neq -1)$ are real and greater than 1 are

A. $a \in (-\infty, -1) \cup (2, \infty)$

B. $a \in (-16/7, -0]$

C. $a \in -[16/7, -1)$

D. $a \in (-1/2, \infty)$

Answer: C

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61. The set of values of 'a' for which the roots of the equation $(a-3)x^2 - 2ax + 5a = 0$ are positive, is

A. $(-\infty, 0) \cup (3, \infty)$

B. $[0, 15/4]$

C. $(3, 15/4)$

D. $(3, 15/4]$

Answer: D

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62. The least integral value of $'a'$ for which the equation $x^2 + 2(a-1)x + (2a+1) = 0$ has both the roots positive, is

A. 3

B. 4

C. 1

D. 5

Answer: B

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63. 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

A. $a < 2$

B. $2 \leq a \leq 3$

C. $3 < a \leq 4$

D. $a > 4$

Answer: A

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64. If the equation $x^2 + 2(x+1)x + 9k - 5 = 0$ has only negative roots , then :

A. $k \leq 0$

B. $k \geq 0$

C. $k \geq 6$

D. $k \leq 6$

Answer: C

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65. The value of K, for which the equations $2x^2 + kx - 5 = 0$ and $x^2 - 3x - 4 = 0$ may have one not in common is/are

A. $-3, \frac{27}{4}$

B. $3, \frac{-27}{4}$

C. $-3, \frac{-27}{4}$

D. $3, \frac{27}{4}$

Answer: C

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66. If the equation $x^2 + 2z + 3 = 0$ and $ax^2 + bx + c = 0$,

a , b,c $\in$ R, have a common root, then $a : b : c :$ is

A. $a + b\omega + c\omega^2 = 0$

B. $a + b\omega^2 + c\omega = 0$

C. $a^3 + b^3 + c^3 = 3abc$

D. all the above

Answer: D

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67. If two equations $x^2 + ax + bc = 0$ and $x^2 + bx + ca = 0$ have a common root, the find the condition and the quadratic with other roots of the equations.

A. a = b

B. a + b = -1

C. a + b = 1

D. a - b = 1

Answer: D

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68. If every pair from among the equations $x^2 + px + qr = 0$, and $x^2 + rx + pq = 0$ have a common root, then $\left(\frac{\text{sum of all distinct roots}}{\text{Product of all distinct roots}}\right)$ is

A. $2(p+q+r)$

B. $p+q+r$

C. $-(p+q+r)$

D. pqr

Answer: B

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69. If every pair from among the equations $x^2 + px + qr = 0, x^2 + qx + rp = 0$ and $x^2 + rx + pq = 0$ has a common root then the product of three common root is

A. pqr

B. 2 pqr

C. $p^2q^2r^2$

D. none of these

Answer: A

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70. 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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71. The values of the parameter a for which the quadratic equations $(1-2a)x^2-6ax-1=0$ and $ax^2-x+1=0$ have at least one root in common, are

A. $0, \frac{1}{2}$

B. $\frac{1}{2}, \frac{2}{9}$

C. $\frac{2}{9}$

D. $0, \frac{1}{2}, \frac{2}{9}$

Answer: C

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72. If the equations $x^2 + bx - 1 = 0$ and $x^2 + x + b = 0$ have a common root different from -1 then $|b|$ is equal to

A. $\sqrt{2}$

B. 2

C. $\sqrt{3}$

D. 3

Answer: C

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73. If a, b, c, $\in$ R and equations $ax^2 + bx + c = 0$ and $x^2 + 2x$ + 9 = 0 have a common root, then find a: b:c .

A. $1 : 2 : 9$

B. $3:2:1$

C. $1:3:2$

D. $3:1:2$

Answer: A

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74. If x is real , then the minimum value of $\frac{x^2-3x+4}{x^2+3x+4}$ is :

A. $(0, 1/7)$

B. $(7, \infty)$

C. $[1/7, 7]$

D. $[-1/7, 7]$

Answer: C

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75. If x is real, then the expression $\frac{x^2+34x-71}{x^2+2x-7}$

A. $[5, 9]$

B. $(-\infty, 5]$

C. $[9, \infty)$

D. $R-(5, 9)$

Answer: D

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76. If x is a real, then the maximum value $\frac{x^2+14x+9}{x^2+2x+3}$

$(i)2(ii)4(iii)6(iv)8$

A. 3, 1

B. -5,4

C. $0, -\infty$

D. $\infty, \ -\infty$

Answer: B

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77. Find the value of a for which function $f(x) = \frac{ax^2 + 3x - 4}{3x - x^2 + a}$ has range off real numbers.

A. $a \leq 1 \text{ or } a \geq 7$

B. $a \geq 1 \text{ or } a \leq 7$

C. $1 \leq a \leq 7$

D. none of these

Answer: C

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

A. 3^{-1} and 3

B. -2 and 0

C. -1 and 1

D. 0 and 2

Answer: A

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79. For $x \in R$ the expression $\dfrac{x^2+2x+c}{x^2+4x+3x}$ can take all real value if $c \in$:

A. $a \in (0, 2)$

B. $a \in [0, 1]$

C. $a \in [-1, 1]$

D. none of these

Answer: B

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80. If the expression $2x^2 + mxy + 3y^2 - 5y - 2$ can be resolved into two rational factors, the value of $|m|$ is

A. ± 7

B. ± 5

C. ± 4

D. ± 1

Answer: A

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81. If the expression $ax^2 + by^2 + cz^2 + 2ayz + 2bzx + 2cxy$ can be resolved into two rational factors, prove that

$a^3 + b^3 + c^3 = 3abc.$

A. abc

B. 3abc

C. 2abc

D. $-3abc$

Answer: B

Watch Video Solution

82. Let a, b, c be nonzero real numbers such that $\int_0^1 (1 + \cos^8 x)(ax^2 + bx + c)dx$ $= \int_0^2 (1 + \cos^8 x)(ax^2 + bx + c)dx = 0$ Then show that the equation $ax^2 + bx + c = 0$ will have one root between 0 and 1 and other root between 1 and 2.

A. no root in (0, 2)

B. at least one root in (1, 2)

C. two roots in (0, 2)

D. two imaginary roots

Answer: B

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83. If $a, b, c \in R, a+b+c=0$ then the quadratic equation $3ax^2+2bx+c=0$ has ________ real roots.

A. at least one root in (0, 1)

B. one root in (2, 3) and the other in (-2, -1)

C. imaginary roots

D. none of these

Answer: A

Watch Video Solution

84. The equation $(x-a)^3+(x-b)^3+(x-c)^3=0$ has :

A. all the roots real

B. one real and two imaginary roots

C. three real roots namely x = a, x = b, x = c

D. none of these

Answer: B

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Section I - Solved Mcqs

1. If α, β are roots of the equation $2x^2+6x+b=0(b<0)$, then $\frac{\alpha}{\beta}+\frac{\beta}{\alpha}$ is less than

A. 2

B. -2

C. 18

D. none of these

Answer: B

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2. If α, β are roots of the equation $ax^2 + 3x + 2 = 0 (a < 0)$, then $\frac{\alpha^2}{\beta} + \frac{\beta^2}{\alpha}$ is greater than

A. 0

B. 1

C. 2

D. none of these

Answer: D

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

A. 0

B. 1

C. 2

D. 3

Answer: B

Watch Video Solution

4. The real values of 'a' for which the quadratic equation $2x^2 - (a^3 + 8a - 1)x + a^2 - 4a = 0$ possess roots of opposite sign is given by:

A. $a > 5$

B. $0 < a < 4$

C. $a > 0$

D. $a > 7$

Answer: B

Watch Video Solution

5. Let

α, β be the roots of $ax^2 + bx + c = 0, \gamma, \det la$ be the roots of $px^2 + qx$

be their respective discrimiant , if $\alpha, \beta, \gamma, \delta$ are in A.P., then the ratio

$D_1 : D_2$ is equal to

A. $\frac{a^2}{b^2}$

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

C. $\frac{b^2}{q^2}$

D. $\frac{c^2}{r^2}$

Answer: B

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6. If α, β are the roots of $ax^2 + bx + c = 0; \alpha + h, \beta + h$ are the roots of $px^2 + gx + r = 0$ and D_1, D_2 the respective discriminants of these equations, then $D_1 : D_2 =$

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

B. $\frac{b^2}{q^2}$

C. $c^2 \frac{)}{r^2}$

D. none of these

Answer: A

Watch Video Solution

7. 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. $\left(\frac{b}{a} - \frac{q}{p}\right)$

B. $\frac{1}{2}\left(\frac{b}{a} - \frac{q}{p}\right)$

C. $-\frac{1}{2}\left(\frac{a}{b} - \frac{p}{q}\right)$

D. none of these

Answer: B

Watch Video Solution

8. The ratio of the roots of the equation $ax^2 + bx + c = 0$ is same as the ratio of roots of equation $px^2 + qx + r = 0$. If D_1 and D_2 are the discriminants of $ax^2 + bx + C = 0$ and $px^2 + qx + r = 0$ respectively, then $D_1 : D_2$

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

B. $\frac{b^2}{q^2}$

C. $\frac{c^2}{r^2}$

D. none of these

Answer: B

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9. If $a \in Z$ and the equation $(x-a)(x-10)+1=0$ has integral roots, then values of a are

A. 10, 8

B. 12, 10

C. 12, 8

D. none of these

Answer: C

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10. clf $a_1, a_2, a_3, . . , a_n \in R$ then $(x - a_1)^2 + (x - a_2)^2 + ... + (x - a_n)^2$ assumes its least value at x=

A. $a_1 + a_2 + ... + a_n$

B. $2(a_1 + a_2, a_3 + ... + a_n)$

C. $n(a_1 + a_2 + ... + a_n)$

D. none of these

Answer: D

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11. The number of solutions of the equation $5^x + 5^{-x} = \log_{10} 25, x \in R$ is

A. 0

B. 1

C. 2

D. infinitely many

Answer: A

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12. If α and β are the roots of the equation $x^2 + ax + b = 0$ and α^4 and β^4 are the roots of the equation $x^2 - px + q = 0$ then the roots of $x^2 - 4bx + 2b^2 - p = 0$ are always

A. both non-real

B. both positive

C. both negative

D. positive and negative

Answer: D

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13. The number of solutions of the equation $9x^2 - 18|x| + 5 = 0$ belonging to the domain of definition of $\log_e\{(x+1)(x+2)\}$, is

A. 1

B. 2

C. 3

D. 4

Answer: C

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14. If the roots of $ax^2 + bx + c = 0(a > 0)$ be each greater than unity, then

A. a + b + c = 0

B. a + b + c $>$ 0

C. a + b + c $<$ 0

D. none of these

Answer: B

Watch Video Solution

15. if α, β be the roots of the equation $(x-a)(x-b)+x=0(c \neq 0)$,

then the roots of the equation $(x-c-\alpha)(x-c-\beta)=c$are

A. a and b + c

B. a + c and b

C. a + c and b + c

D. a - b and b - c

Answer: C

Watch Video Solution

16. The number of real roots of $(6-x)^4+(8-x)^4=16$, is

A. 0

B. 2

C. 4

D. none of these

Answer: B

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17. The number of real solutions of the equation $(9/10)^x=-3+x-x^2$ is

A. 0

B. 1

C. 2

D. none of these

Answer: A

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18. The set of values of a for which each on of the roots of $x^2 - 4ax + 2a^2 - 3a + 5 = 0$ is greater than 2, is

A. $a \in (1, \infty)$

B. $a = 1$

C. $a \in (- \infty, 1)$

D. $a \in (9/2, \infty)$

Answer: D

Watch Video Solution

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

$aa' + \hat{} (') = 1$

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

B. $\frac{a}{a'} = \frac{c}{c'}$

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

D. $aa' + ' = 1$

Answer: B

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20. 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. 7

D. 8

Answer: C

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

A. $|\alpha| = |\beta|, |\alpha| > 1$

B. $|\alpha| \geq 1$

C. $|\beta| < 1$

D. none of these

Answer: A

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22. The roots of the equatiion $(a + \sqrt{b})^{x^2 - 15} + (a - \sqrt{b})^{x^2 - 15} = 2a$ 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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23. if $(1+k)\tan^2 x - 4\tan x - 1 + k = 0$ has real roots $\tan x_1$ and $\tan x_2$ then

A. $k^2 \leq 5$

B. $\tan(x_1 + x_2) = 2$

C. for $k = 2$, $x_1 = \pi/4$

D. all of these

Answer: D

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24. The number of values of the pair (a, b) for which $a(x+1)^2 + b(-x^2 - 3x - 2) + x + 1 = 0$ is an identity in x, is

A. 0

B. 1

C. 2

D. Infinite

Answer: B

Watch Video Solution

25. 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 $(b, +\infty)$

A. both roots in [a, b]

B. both roots in $(-\infty, a]$

C. both roots in (b, ∞)

D. one roots in $(-\infty, a)$ and other in (b, ∞)

Answer: D

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26. 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 $p and q$, respectively, are $-2, -32$ b. $-2, 3$ c. $-6, 3$ d. $-6, -32$

A. $-2, -32$

B. $-2, 3$

C. $-6, 3$

D. $-6, -32$

Answer: A

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27. Let $f(x) = ax^3 + 5x^2 - bx + 1$. If f(x) when divied by 2x + 1 leaves 5 as remainder, and f'(x) is divisible by 3x - 1, then

A. $a = 26, b = 10$

B. $a = 24, b = 12$

C. $a = 26, b = 12$

D. none of these

Answer: C

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28. If $a, b, c(abc^2)x^2 + 3a^2cx + b^2cx - 6a^2 - ab + 2b^2 = 0$ ares rational.

A. rational

B. imaginary

C. irratiional

D. none of these

Answer: A

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29. If a, b, c are in H.P., then the equation $a(b-c)x^2+b(c-a)x+c(a-b)=0$

A. has real and distinct roots

B. has equal roots

C. has no real root

D. none of these

Answer: B

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30. 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 2 b. 1 c. 0 d. none of these

A. 1

B. 2

C. 0

D. none of these

Answer: A

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31. If the ratio of the roots of the equation $ax^2+bx+c=0$ is equal to ratio of roots of the equation $x^2+x+1=0$ then a,b,c are in

A. A.P.

B. G.P.

C. H.P.

D. none of these

Answer: B

Watch Video Solution

32. If a, b, c are positive and a = 2b + 3c, then roots of the equation $ax^2 + bx + c = 0$ are real for

A. $\left|\frac{a}{c} - 11\right| \geq 4\sqrt{7}$

B. $\left|\frac{c}{a} - 11\right| \geq 4\sqrt{7}$

C. $\left|\frac{b}{c} + 4\right| \geq 2\sqrt{7}$

D. $\left|\frac{c}{b} - 4\right| \geq 2\sqrt{7}$

Answer: A

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33. If $a, b, c \in R$ and the quadratic equation $x^2 + (a+b)x + c = 0$ has no real roots then

A. $c(a+b+c) > 0$

B. $c + (a+b+c)c > 0$

C. $c - c(a+b+c) > 0$

D. $c(a+b-c) > 0$

Answer: B

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34. If both roots of the quadratic equation $x^2 - 2ax + a^2 - 1 = 0$ lie in $(-2, 2)$ which one of the following ca be $[a]$? (where [.] denotes the greatest integer function)

A. $-1, 0$

B. 0, 1

C. 1, 2

D. none of these

Answer: A

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35. If $.^6C_k + 2 \cdot .^6C_{k+1} + .^6C_{k+2} > .^8C_3$ then the quadratic equation whose roots are α, β and $\alpha^{k-1}, \beta^{k-1}$ have

A. no common root

B. one common root

C. both common roots

D. imaginary roots

Answer: C

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

A. 5

B. 6

C. 2

D. 3

Answer: D

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37. Let $f(x) = x^3 + 3x^2 + 9x + 6\sin x$ then roots of the equation $\dfrac{1}{x - f(1)} + \dfrac{2}{x - f(2)} + \dfrac{3}{x - f(3)} = 0$, has

A. no real root

B. one real root

C. two real roots

D. more than 2 real roots

Answer: C

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38. The number of integral values of a for which $x^2-(a-1)x+3=0$ has both roots positive and $x^2+3x+6-a=0$ has both roots negative is

A. 0

B. 1

C. 2

D. infinite

Answer: B

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39. If 1 lies between the roots of equation $y^2 - my + 1 = 0$ and [x] denotes the integral part of x, then $\left[\left(\frac{4|x|}{x^2+16}\right)^m\right]$ where $x \in R$ is equal to

A. 0

B. 1

C. 2

D. undefined

Answer: A

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40. 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. real and distinct

B. non-real complex

C. real and equal

D. integers

Answer: A

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41. If $ax^2+bx+c=0, a\neq 0, a, b, c \in R$ has distinct real roots in $(1, 2)$, then a and $5a+2b+c$ have (a) same sign (b) opposite sign (c) not determined (d) none of these

A. of same type

B. of opposite type

C. undetermined

D. none of these

Answer: A

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42. If the equation $ax^2 + bx + 6 = 0$ has real roots, where $a \in R, b \in R$, then the greatest value of 3a + b, is

A. 4

B. -1

C. -2

D. 1

Answer: C

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43. If a and b are distinct positive real numbers such that $a, a_1, a_2, a_3, a_4, a_5, b$ are in A.P. , $a, b_1, b_2, b_3, b_4, b_5, b$ are in G.P. and $a, c_1, c_2, c_3, c_4, c_5, b$ are in H.P., then the roots of $a_3x^2 + b_3x + c_3 = 0$ are

A. real and distinct

B. real and equal

C. imaginary

D. none of these

Answer: C

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44. The roots of $ax^2 + bx + c = 0$ whose $a \ne 0, b, c \in R,$ " are non-real complex and " a + c lt b, " then

A. $4a + c > 2b$

B. $4a + c < 2b$

C. $4a + c = 2b$

D. none of these

Answer: B

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45. If α and β are non-real, then condition for $x^2 + \alpha x + \beta = 0$ to have real roots, is

A. $(\alpha - \overline{\alpha})(\beta - \bar{\beta}) = (\alpha\bar{\beta} - \overline{\alpha}\beta)^2$

B. $(\overline{\alpha} - \alpha)(\alpha\bar{\beta} - \overline{\alpha}\beta) = (\beta - \bar{\beta})^2$

C. $(\beta - \bar{\beta})(\alpha\bar{\beta} - \overline{\alpha}\beta) = (\overline{\alpha} - \alpha)^2$

D. none of these

Answer: B

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46. If $a > 1$, then the roots of the equation $(1 - a)x^2 + 3ax - 1 = 0$ are

A. one positive and one negative

B. both negative

C. both positive

D. both non-ral complex

Answer: C

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47. If a, b $\in$ R, then the equation $x^2 - abx - a^2 = 0$ has

A. one positive and one negative root

B. both positive roots

C. both negative roots

D. non-real roots

Answer: A

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48. The set of real values of a for which the equation $x^2 = a(x + a)$ has its roots greater than a is

A. $(-2, -1/2)$

B. $(-1/2, -1/4)$

C. $(-\infty, 0)$

D. none of these

Answer: D

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49. 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.

A. $a = b \neq c$

B. $a = -b = c$

C. $a = b = c$

D. none of these

Answer: C

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50. if $\cos^4 x + \sin^2 x - p = 0$ has real solutions then

A. $p \leq 1$

B. $\frac{3}{4} \leq p < 1$

C. $p \geq \frac{3}{4}$

D. none of these

Answer: B

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51. If $a.\,3^{\tan x} + a.\,3^{-\tan x} - 2 = 0$ has real solutions, $x \neq \frac{\pi}{2}, 0 \leq x \leq \pi$, then find the set of all possible values of parameter 'a'.

A. [-1, 1]

B. [-1, 0]

C. (0, 1]

D. $(0, \infty)$

Answer: C

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52. If a, b are the real roots of $x^2 + px + 1 = 0$ and c, d are the real roots of $x^2 + qx + 1 = 0$, then $(a - c)(b - c)(a + d)(b + d)$ is divisible by

A. $a - b - c - d$

B. $a + b + c - d$

C. $a + b + c + d$

D. $a - b - c - d$

Answer: C

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53. If a and 4a + 3b + 2c have same sign. Then, $ax^2 + bx + c = 0 (a \neq 0)$ cannot have both roots belonging to

A. $(-1, 2)$

B. $(-1, 1)$

C. (1, 2)

D. $(-2, -1)$

Answer: C

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54. Let $f(x) = ax^2 + bx + c$ and $f(-1) < 1, f(1) > -1, f(3) < -4$ and $a \neq 0$, then

A. $a > 0$

B. $a < 0$

C. sign of a cannot be determined

D. none of these

Answer: B

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55. The equations $x^2 + b^2 = 1 - 2bx$ and $x^2 + a^2 = 1 - 2ax$ have only oneroot in common then $|a - b| =$

A. 1

B. 0

C. 2

D. none of these

Answer: C

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56. Total number of integral values of a such that $x^2 + ax + a + 1 = 0$ has integral roots is equal to : (A) one 45. (B) two (C) three (D) four

A. one

B. two

C. three

D. four

Answer: B

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57. If $ax^2 + bx + c = 0$ has no real roots and a, b, c $\in$ R such that $a + c > 0$, then

A. $a - b + c < 0$

B. $a - b + c > 0$

C. $a + c = b$

D. all of these

Answer: B

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58. Number of possible value(s) of integer 'a' for which the quadratic equation $x^2 + ax + 16 = 0$ has integral roots, is

A. 4

B. 6

C. 2

D. none of these

Answer: B

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59. If a, b, c are rational and no two of them are equal, then the equations

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

and, $a(b - c)x^2 + b(c - a)x + c(a - b) = 0$

A. have rational roots and exactly one them is common

B. will be such that at least one has rational roots

C. have at least one root common.

D. no common root

Answer: A

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60. If all real values of x obtained from the equation $4^x - (a-3)2^x + a - 4 = 0$ are non-positive, then a lies in

A. (4, 5]

B. (0, 4)

C. $(4, \infty)$

D. none of these

Answer: A

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61. Set of values of 'a' for which both roots of the equation $x^2 - 2x - a^2 = 0$ lie between the roots of the equation $x^2 - 2x + a^2 - 11a + 12 = 0$, is

A. (1, 4)

B. (3/2, 4)

C. $(- 4, 4)$

D. none of these

Answer: B

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62. The equation $10x^4 - 3x^2 - 1 = 0$ has

A. no rational but three irrational roots

B. one rational and two irrational roots

C. no real roots

D. three rational roots

Answer: A

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63. The set of values of 'a' for which one negative and two positive roots of the equation $x^3 - 3x + a = 0$ are possible, is

A. (0, 2)

B. (0, 4)

C. (2, 4)

D. (0, 10)

Answer: A

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64. If the equation $\frac{1}{x}+\frac{1}{x+a}=\frac{1}{\lambda}+\frac{1}{\lambda+a}$ has real roots that are equal in magnitude and opposite in sign, then

A. $\lambda^2=3a^2$

B. $\lambda^2=2a^2$

C. $\lambda^2=a^2$

D. $a^2=2\lambda^2$

Answer: D

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65. The equation $|x+1||x-1|=a^2-2a-3$ can have real solutions for x, if a belongs to

A. $(-\infty,-1]\cup[3,\infty)$

B. $[1-\sqrt{5},1+\sqrt{5}]$

C. $[1-\sqrt{5},1]\cup[3,1+\sqrt{5}]$

D. none of these

Answer: C

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66. If $x^2 - px + q = 0$ has equal integral roots, then

A. p and q are even integers

B. p and q are odd integers

C. p an even integer and q is a perfect square of a positive integer

D. none of these

Answer: C

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67. Let A, G, and H are the A.M., G.M. and H.M. respectively of two unequal positive integers. Then, the equation $Ax^2 - Gx - H = 0$ has

A. both roots as fractions

B. one root which is a negative fraction and other positive root

C. at least one root which is an integer

D. none of these

Answer: B

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68. If b is the harmonic mean of a and c and α, β are the roots of the equation $a(b-c)x^2 + b(c-a)x + c(a-b) = 0$, then

A. $\alpha + \beta = 3$

B. $\alpha + \beta = \frac{1}{2}$

C. $\alpha\beta = 2$

D. $\alpha = 1, \beta = 1$

Answer: D

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69. If the expression $a^2(b^2 - c^2)x^2 + b^2(c^2 - a^2)x + c^2(a^2 - b^2)$ is a perfect square, then

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

B. a^2, b^2, c^2 are in A.P.

C. a^2, b^2, c^2 are in H.P.

D. a^2, b^2, c^2 are in G.P.

Answer: C

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70. Let $pandq$ be the roots of the equation $x^2 - 2x + A = 0$ and let $rands$ be the roots of the equation `x^2-18 x+B=0.If p

A. A = 3, B = 77

B. A = -3, B = 77

C. A = 3, B = - 17

D. none of these

Answer: B

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71. The equation $x^2 + ax + b^2 = 0$ has two roots each of which exceeds a number c, then :

A. $a^2 < 4b^2$

B. $c^2 + ac + b^2 > 0$

C. $-a/2 < c$

D. none of these

Answer: B

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72. If $ax^2 + bx + 10 = 0$ does not have two distinct real roots, then the least value of 5a + b, is

A. -3

B. -2

C. 3

D. none of these

Answer: B

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

A. roots are rational

B. if one root is $p + \sqrt{q}$, then the other is $-p + \sqrt{q}$

C. and if one root is $-p - \sqrt{q}$, then other root $p - \sqrt{q}$

D. none of these

Answer: C

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74. The value of a for which exactly one root of the equation $e^a x^2 - e^{2a} x + e^a - 1$ lies between 1 and 2 are given by

A. In $\left(\frac{5-\sqrt{17}}{4}\right) < a < \text{In}\left(\frac{5+\sqrt{17}}{4}\right)$

B. $0 < a < 100$

C. In $\frac{5}{4} < a < \text{In}\frac{10}{3}$

D. none of these

Answer: A

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75. Let $f(x) = ax^2 + bx + c \forall a, b, c \in R, a \neq 0$ satisfying $f(1) + f(2) = 0$. Then, the quadratic equation $f(x) = 0$ must have :

A. no real root

B. 1 and 2 as real roots

C. two equal roots

D. two distinct real roots

Answer: D

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76. Which one of the following is not true? The quadratic equation $x^2 - 2x - a = 0, a \neq 0,$

A. cannot have a real root if $a < -1$

B. may not have a rational root even if a is a perfect square

C. cannot have an integral root if $n^2 - 1 < a < n^2 + 2n$, where n = 0, 1, 2,......

D. none of these

Answer: D

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77. In a quadratic equation with leading coefficient 1, a student read the coefficient 16 of x wrong as 19 and obtain the roots as -15 and -4. The correct roots are

A. 6, 10

B. $-6, \ -10$

C. $-7, \ -9$

D. none of these

Answer: B

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78. if α is a real root of $2x^3 - 3x^2 + 6x + 6 = 0$, then find $[\alpha]$` where []

denotes the greatest integer function.

A. 0

B. -1

C. 1

D. -2

Answer: B

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

Answer: B

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80. The number of real solutions of $1 + |e^x - 1| = e^x(e^x - 2)$

A. 0

B. 1

C. 2

D. 4

Answer: B

Watch Video Solution

81. 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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82. IF the equations $x^3 + 5x^2 + px + q = 0$ and $x^3 + 7x^2 + px + r = 0$ have two roots in common, then the product of two non-common roots of two equations, is

A. 35

B. -35

C. 35 + p - q

D. 35 + p + q - r

Answer: A

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

A. $(-3, \infty)$

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

C. $(-1, \infty)$

D. $(-\infty, -1)$

Answer: B

Watch Video Solution

84. 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

A. 4

B. -4

C. 8

D. none of these

Answer: D

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85. If $f(x) = x^2 + 2bx + 2c^2$ and $g(x) = -x^2 - 2cx + b^2$ are such that min $f(x) > max g(x)$, then the relation between b and c is

A. no real values b and c

B. $0 < c < \sqrt{2}b$

C. $|c| < \sqrt{2}|b|$

D. $|c| > \sqrt{2}|b|$

Answer: D

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86. 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 $p^3 - q(3p - 1) + q^2 = 0$ $p^3 - q(3p + 1) + q^2 = 0$ $p^3 + q(3p - 1) + q^2 = 0$ $p^3 + q(3p + 1) + q^2 = 0$

A. $p^3 - (3p - 1)q + q^2 = 0$

B. $p^3-(3p+1)q+q^2=0$

C. $p^3+(3p-1)q+q^2=0$

D. $p^3+(3p+1)q+q^2=0$

Answer: A

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

A. $-1, 2$

B. $-1, 1$

C. $0, \ -1$

D. 0, 1

Answer: C

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88. If α, β, γ the roots of the equation $x^3 + 4x1 = 0,$ then find the value of $(\alpha + \beta)^{-1} + (\beta + \gamma)^{-1} + (\gamma + \alpha)^{-1}$.

A. 2

B. 3

C. 4

D. 5

Answer: C

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89. If the sum of the two roots of $x^3 + px^2 + ax + r = 0$ is zero then $pq =$

A. $-r$

B. r

C. 2r

D. $-2r$

Answer: B

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90. A polynomial in x of degree greater than three, leaves remainders 1, -2 and-1 when divided, respectively, by (x-l), (x + 2) and (x + 1). What will be the remainder when is divided by (x - 1) (x +2) (x + 1).

A. (7x)^2 + (3/2)x - (2/3)

B. $-2x$

C. x

D. $-x$

Answer: A

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91. 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. [4, 5]

B. $(-\infty, 4)$

C. $(6, \infty)$

D. (5, 6]

Answer: B

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92. 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 then 4 lie in the interval

A. $(-2, 0)$

B. $(3, \infty)$

C. $(-1, 3)$

D. (1, 4)

Answer: C

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93. If x is real, the maximum value of $\frac{3x^2 + 9x + 17}{3x^2 + 9x + 7}$ is

(a) $\frac{17}{7}$

(b) $\frac{1}{4}$

(c) 41

(d) 1

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

B. 41

C. 1

D. $\frac{17}{7}$

Answer: B

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94. 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. greater than 4 ab

B. less than 4 ab

C. greater than -4ab

D. less than -4ab

Answer: C

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95. 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

A. 3

B. 2

C. 1

D. 4

Answer: B

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96. 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 $1 + \frac{c}{a} + \left|\frac{b}{a}\right| < 0$

A. < 0

B. > 0

C. ≤ 0

D. none of these

Answer: A

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97. Ifα, β and γ are the roots of $X^3 - 3X^2 + 3X + 7 + 0,$ find the value of $\frac{\alpha = 1}{\beta - 1} + \frac{\beta - 1}{\gamma - 1} + \frac{\gamma - 1}{\alpha - 1}$.

A. $3 / \omega$

B. ω^2

C. $2\omega^2$

D. $3\omega^2$

Answer: D

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

A. 2

B. 3

C. 4

D. none of these

Answer: A

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99. The minimum value of $\frac{x^2 + 2x + 4}{x + 2}$, is

A. 0

B. 1

C. 2

D. 3

Answer: C

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100. 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 (1) $\frac{2}{9}(p-q)(2q-p)$ (2) $\frac{2}{9}(q-p)(2p-q)$ (3) $\frac{2}{9}(q-2p)(2q-p)$ (4) $\frac{2}{9}(2p-q)(2q-p)$

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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101. Let a,b,c be the sides of a triangle. Now two of them are equal to $\lambda \varepsilon R$. 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. $\lambda \in \left(\frac{4}{3}, \frac{5}{3}\right)$

Answer: A

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102. In the quadratic equation $ax^2 + bx + c = 0, \Delta = b^2 - 4ac$ and $\alpha + \beta, \alpha^2 + \beta^2, \alpha^3 + \beta^3,$ are in G.P , where α, β are the roots of $ax^2 + bx + c,$ then (a) $\Delta \neq 0$ (b) $b\Delta = 0$ (c) $c\Delta = 0$ (d) $\Delta = 0$

A. $\Delta \neq 0$

B. $b\Delta = 0$

C. $c\Delta = 0$

D. $bc \neq 0$

Answer: C

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103. If α, β, γ are the roots of the equation $x^3 + x + 1 = 0$, then the value of $\alpha^3 + \beta^3 + \gamma^3$, is

A. 0

B. 3

C. -3

D. -1

Answer: C

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104. If α, β are roots ....

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

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

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

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

Answer: A

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105. If α, β are the roots of the equation $\lambda(x^2 - x) + x + 5 = 0$ and if λ_1 and λ_2 are two values of λ obtained from $\frac{\alpha}{\beta} + \frac{\beta}{\alpha} = 4$, then $\frac{\lambda_1}{\lambda_2^2} + \frac{\lambda_2}{\lambda_1^2}$ equals.

A. 4192

B. 4144

C. 4096

D. 4048

Answer: D

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106. If a $\in$ R and the equation $(a-2)(x-[x])^2+2(x-[x])+a^2=0$ (where [x] denotes the greatest integer function) has no integral solution and has exactly one solution in (2, 3), then a lies in the interval

A. $(-1, 2)$

B. (0, 1)

C. $(-1, 0)$

D. (2, 3)

Answer: C

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107. If all the roots of $x^3 + px + q = 0 p, q \in R, q \neq 0$ are real, then

A. $p < 0$

B. $p = 0$

C. $p > 0$

D. $p > q$

Answer: A

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108. If three distinct real number a,b and c satisfy $a^2(a+p) = b^2(b+p) = c^2(c+p)$, where $p\varepsilon R$, then value of $bc + ca + ab$ is :

A. $-p$

B. p

C. 0

D. $p^2/2$

Answer: C

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109. Let $(\sin a)x^2 + (\sin a)x + 1 - \cos a = 0$. The set of values of a for which roots of this equation are real and distinct, is

A. $\left(0, 2\frac{\tan^{-1}(1)}{4}\right)$

B. $\left(o, \frac{2\pi}{3}\right)$

C. $(0, \pi)$

D. $(0, 2\pi)$

Answer: A

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

A. 1220

B. 1110

C. 1210

D. 1310

Answer: C

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111. Let p and q real number such that $p\ne 0, p^3\ne q$ and $p^3\ne -q$. 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. $\left(p^3+q\right)x^2-\left(p^3+2q\right)x+\left(p^3+q\right)=0$

B. $\left(p^3+q\right)x^2-\left(p^3-2q\right)x+\left(p^3+q\right)=0$

C. $\left(p^3-q\right)x^2-\left(5p^3-2q\right)x+\left(p^3-q\right)=0$

D. $\left(p^3-q\right)x^2-\left(5p^3+2q\right)x+\left(p^3-q\right)=0$

Answer: B

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112. Let a, b and c be three real numbers satisfying $[a \quad b \quad c][\{:(1,9,7),(8,2,7),(7,9,7):\}]=[0 \quad 0 \quad 0]$ and α and β be the roots of the equation $ax^2+bx+c=0$, then $\sum_{n=0}^{\infty}\left(\frac{1}{\alpha}+\frac{1}{\beta}\right)^n$, is

A. 6

B. 7

C. $\frac{6}{7}$

D. ∞

Answer: B

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113. The number of distinct real roots of $x^4 - 4x^3 + 12x62 + x - 1 = 0is\_\_\_\_\_$.

A. 1

B. 0

C. 2

D. 4

Answer: C

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114. 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. $-i\sqrt{3}$

C. $i\sqrt{5}$

D. $\sqrt{2}$

Answer: B

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

A. 9

B. 6

C. 18

D. 3

Answer: C

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116. 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: D

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117. 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. $-\frac{5}{2}$ and 1

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

C. $-\frac{7}{2}$ and 2

D. $-\frac{9}{2}$ and 3

Answer: B

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118. The number of polynomials f(x) with non-negative integer coefficients of degree ≤ 2, satisfying f(0) = 0 and $\int_0^1 f(x)dx = 1$, is

A. 8

B. 2

C. 4

D. 0

Answer: B

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

A. $(-2, -1)$

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

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

D. (1, 2)

Answer: C

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120. if $\alpha, \beta, \neq 0 \quad \text{and} \quad f(n) = \alpha^n + \beta^n$

$$\text{and} \begin{vmatrix} 3 & 1+f(1) & 1+f(2) \\ 1+f(1) & 1+f(2) & 1+f(3) \\ 1+f(2) & 1+f(3) & 1+f(4) \end{vmatrix}$$

$= k(1-\alpha)^2(1-\beta)^2(\alpha-\beta)^2$ then k is equal to

A. 1

B. -1

C. $\alpha\beta$

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

Answer: A

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121. $e^{|\sin x|} + e^{-|\sin x|} + 4a = 0$ will have exactly four different solutions in $[0, 2\pi]$ if

A. $a \in \left[-\frac{e}{4}, -\frac{1}{4}\right]$

B. $a \in R$

C. $a \in \left[-\frac{-1-e^2}{4e}, \infty\right)$

D. none of these

Answer: D

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122. The sum of all real values of x satisfying the equation

$\left(x^2 - 5x + 5\right)^{x^2 + 4x - 60} = 1$ is

A. 3

B. -4

C. 6

D. 5

Answer: B::D

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123. Let $-\frac{\pi}{6} < \theta < -\frac{\pi}{12}$. 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: C

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Section II - Assertion Reason Type

1. 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 $\alpha, \frac{1}{\beta}$ 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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2. 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 $1 + \frac{c}{a} + \left|\frac{b}{a}\right| < 0$

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. If α and β are the roots of the equation $x^2 - ax + b = 0$ and $A_n = \alpha^n + \beta^n$, then which of the following is true ?

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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4. Statement-1: $If \alpha$ and β are real roots of the quadratic equations $ax^2 + bx + c = 0$ and $-ax^2 + bx + c = 0$, then $\frac{a}{2}x^2 + bx + c = 0$ has a real root between α and β

Statement-2: If f(x) is a real polynomial and $x_1, x_2 \in R$ such that $f(x_1)f_{x_2} < 0$, then f(x) = 0 has at leat one real root between x_1 and x_2.

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 a, b, c, A, B, C are real numbers such that $a < b < c$, then

$f(x) = (x-a)(x-b)(x-c) - A^2(x-a) - B^2(x-b) - C^2(x-c)$

has exactly one real root.

Statement-2: If f(x) is a real polynomical and $x_1, x_2 \in R$ such that $f(x_1)f(x_2) < 0$, then f(x) has at least one real root between x_1 and x_2

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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6. Statement I: $x^2 - 5x + 6 < 0$ if $2 < x < 3$ Statement II: If α and β, $(\alpha < \beta)$ are the roots of the equation $ax^2 + bx + c = 0$ and $\alpha < x < \beta$ then $ax^2 + bx + c$ and a have opposite signs

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. about to only mathematics

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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8. Statement-1: There is a value of k for which the equation $x^3 - 3x + k = 0$ has a root between 0 and 1.

Statement-2: Between any two real roots of a polynomial there is a root of its derivation.

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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9. Statement-1: $If x^2 + ax + 4 > 0$for all$x \in R$, then $a \in (-4, 4)$.

Statement-2: The sign of quadratic expression $ax^2 + bx + c$ is always same as that of 'a' except for those values of x which lie between its roots.

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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10. If the roots of the equation $ax^2 + bx + c = 0, a \neq 0(a, b, c$ are real numbers), are imaginary and $a + c < b,$ then

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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11. Statement (1) : If a and b are integers and roots of $x^2 + ax + b = 0$ are rational then they must be integers. Statement (2): If the coefficient of x^2 in a quadratic equation is unity then its roots must be integers

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: C

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12. Statement-1: If a, b, c are distinct real numbers, then $a\frac{(x-b)(x-c)}{(a-b)(a-c)}+b\frac{(x-c)(x-a)}{(b-c)(b-a)}+c\frac{(x-a)(x-b)}{(c-a)(c-b)}=x$ for each real x.

Statement-2: $If a, b, c \in R$ such that $ax^2+bx+c=0$ for three distinct real values of x, then $a=b=c=0$ i.e. $ax^2+bx+c=0$ for all $x \in R$.

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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13. Let $f(x) = ax^2 + bx + c$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)$a = 0$ (b) $b = 0$ (c) $c = 0$ (d) nothing can be said about a, b, 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: C

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14. Statement-1: $If a, b, c \in R$ and $2a + 3b + 6c = 0$, then the equation $ax^2 + bx + c = 0$ has at least one real root in (0, 1).

Statement-2: If f(x) is a polynomial which assumes both positive and negative values, then it has at least one 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.

Answer: B

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15. Statement-1: $If a \neq 0$ and the equation $ax^2 + bx + c = 0$ has two roots α and β such that $\alpha < -1$ and $\beta > 1$, then a+|b|+c and a have the opposite sign.

Statement-2: $Ifax^2 + bx + c$, is same as that of 'a' for all real values of x except for those values of x lying between the roots.

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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16. Statement-1: $If a, b, c \in Q$ and $2^{1/3}$ is a root of $ax^2 + bx + c = 0$, then a = b = c = 0.

Statement-2: A polynomial equation with rational coefficients cannot have irrational roots.

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: C

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17. Statement-1: $If f(x) = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!}$, then the equation f(x) = 0 has two pairs of repeated roots.

Statement-2 Polynomial equation P(x) = 0 has repeated root α, if $P(\alpha) = 0 \text{ and } P'(\alpha) = f0$

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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18. 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 $\frac{9 \cdot 3^{2x} + 6 \cdot 3^x + 4}{9 \cdot 3^{2x} - 6 \cdot 3^x + 4}$ lies are

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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19. Let a, b, c be real numbers such that $ax^2 + bx + c = 0$ and $x^2 + x + 1 = 0$ have a common root.

Statement-1: a = b = c

Staement-2: Two quadratic equations with real coefficients cannot have only one imainary root common.

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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20. Statement-1: The cubic equation $4x^3 - 15x^2 + 14x - 5 = 0$ has a root in the internal (2, 3).

Statement-2: If f(x) is a polynomial equation which has two real roots $\alpha, \beta(\alpha < \beta)$, then f(x) = 0 will have a root $\gamma such t^\hat{}$alpha lt gamma lt beta`.

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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21. Statement-1: The equation $\frac{\pi^e}{x-e}+\frac{e^\pi}{x-\pi}+\frac{\pi^\pi+e^e}{x-\pi-e}=0$ has real roots.

Statement-2: If f(x) is a polynomial and a, b are two real numbers such that $f(a)f(b)<0$, then f(x) = 0 has an odd number of real roots between a and b.

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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22. Consider a quadratic equation $ax^2 + bx + c = 0$, where 2a + 3b + 6c = 0 and let $g(x) = a\frac{x^3}{3} + b\frac{x^2}{2} + cx$.

Statement-1 The quadratic equation has at least one root in the internal (0, 1).

Statement-2 The Rolle's Theorem is applicable to function g(x) on the interval [0, 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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Exercise

1. If $A = \{x : f(x) = 0\}$ and $B = \{x : g(x) = 0\}$, then $A \cup B$ will be the set of roots of the equation

A. $\{f(x)\}^2 + \{g(x)\}^2 = 0$

B. $\dfrac{f(x)}{g(x)}$

C. $\dfrac{g(x)}{f(x)}$

D. none of these

Answer: A

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2. Let x_1 and x_2 be the roots of the eqiation $x^2 - 3x + A = 0$ and let x_3 and x_4 be the roots of the equation $x^2 - 12x + B = 0$. It is known that the numbers x_1, x_2, x_3, x_4 (in that order) from an increasing GP. Find A and B.

A. p = 2, q = 16

B. p = 2, q = 32

C. p = 4, q = 16

D. p = 4, q = 32

Answer: B

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3. The equation $\left|x^2 - x - 6\right| = x + 2$ has :

A. -2, 1, 4

B. 0, 2, 4

C. 0, 1, 4

D. -2, 2, 4

Answer: D

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4. If the equation $x^3 - 3x + a = 0$ has distinct roots between 0 and 1, then the value of a is

A. 2

B. $1/2$

C. 3

D. none of these

Answer: D

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5. 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.

A. at least three real roots

B. no real roots

C. at least two real roots

D. two real roots and two imaginary roots

Answer: C

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6. Prove that equation $2\cos^2\frac{x}{2}\sin^2 x = x^2 + x^{-2}, 0 < x \leq \frac{\pi}{2}$ has no solution.

A. no real solution

B. one real solution

C. more than one real solution

D. none of these

Answer: A

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

A. 1

B. 2

C. 3

D. none of these

Answer: D

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8. The roots of the equation $\log_2(x^2 - 4x + 5) = (x - 2)$ are

A. 4, 5

B. 2, -3

C. 2, 3

D. 3, 5

Answer: C

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9. Let $a, b,$ and c be real numbers such that $4a + 2b + c = 0$ and $ab > 0.$ Then the equation `a x^2+b x+c = 0

A. real roots

B. complex roots

C. exactly one root

D. none of these

Answer: A

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10. The value of k for which the equation $3x^2 + 2x(k^2 + 1) + k^2 - 3k + 2 = 0$ has roots of opposite signs, lies in

the interval

A. $(-\infty, 0)$

B. $(-\infty, -1)$

C. $(1, 2)$

D. $(3/2, 2)$

Answer: C

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11. If p and q are roots of the quadratic equation $x^2 + mx + m^2 + a = 0$, then the value of $p^2 + q^2 + pq$, is

A. 0

B. a

C. $-a$

D. $\pm m^2$

Answer: C

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12. If one root of the equation $ax^2 + bx + c = 0$ is double the other, then the relation between a, b, c is

A. $b^2 = 9ac$

B. $2b^2 = 9ac$

C. $2b^2 = ac$

D. $b^2 = ac$

Answer: B

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13. If $e^{\cos x} - e^{-\cos x} = 4$, then the value of cos x, is

A. $\log_e(2+\sqrt{5})$

B. $-\log_e(2+\sqrt{5})$

C. $\log_e(-2+\sqrt{5})$

D. none of these

Answer: D

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14. If one root of the polynomial $f(x)=5x^2+13x+k$ is reciprocal of the other, then the value of k is (a) 0 (b) 5 (c) $\frac{1}{6}$ (d) 6

A. 0

B. 5

C. $1/6$

D. 6

Answer: B

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

A. 0

B. $1/2$

C. 1

D. none of these

Answer: A

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

A. 3

B. 2

C. 1

D. none of these

Answer: B

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

A. 2

B. 4

C. 6

D. none of these

Answer: B

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18. If the product of the of the equation $x^2 - 3kx + 2e^{2\log_{ek}}$ = $1is7$, then the roots are real for $k^2 =$

A. ± 1

B. 2

C. ± 3

D. none of these

Answer: B

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19. If one root of $x^2 + px + 12 = 0$ is 4, while the equation $x^2 + px + q = 0$ has equal roots, then the value of q is

A. $49/4$

B. $4/49$

C. 4

D. none of these

Answer: A

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20. if the difference of the roots of the equation $x^2 - px + q = 0$ is unity.

A. $p^2 = 4q$

B. $p^2 = 4q + 1$

C. $p^2 = 4q - 1$

D. none of these

Answer: B

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21. If α, β are roots of the equation $ax^2 + bx + c = 0$ then the equation whose roots are $2\alpha + 3\beta$ and $3\alpha + 2\beta$ is

A. $abx^2 - (a+b)cx + (a+b)^2 = 0$

B. $acx^2 - (a+c)bx + (a+c)^2 = 0$

C. $acx^2 + (a+c)bx - (a+c)bx - (a+c)^2 = 0$

D. none of these

Answer: D

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22. The number of roots of the equation, $x - \frac{2}{x-1} = 1 - \frac{2}{x-1}$ is 0

(b) 1 (c) 2 (d) 3

A. 1

B. 2

C. 0

D. infinitely many

Answer: C

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

A. 4

B. 3

C. 2

D. 1

Answer: A

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24. If the equation $\frac{a}{x-a}+\frac{b}{x-b}=1$has two roots equal in magnitude and opposite in sign then the value of $a+b$ is

A. -1

B. 0

C. 1

D. none of these

Answer: B

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25. If one of the roots of the equation $ax^2+bx+c=0$ be reciprocal of one of the $a_1x^2+b_1x+c_1=0$, then prove that $(aa_1-cc_1)^2=(bc_1-ab_1)(b_1c-a_1b)$.

A. $(aa_1-cc_1)^2=(bc_1-b_1a)(b_1c-a_1b)$

B. $(ab_1-a_1b)^2=(bc_1-b_1c)(ca_1-c_1a)$

C. $(bc_1 - b_1c)^2 = (ca_1 - a_1c)(ab_1 - a_1b)$

D. none of these

Answer: A

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26. If $\sin\alpha$ and $\cos\alpha$ are roots of the equation $px^2 + qx + r = 0$ then :

A. $p^2 - q^2 + 2pr = 0$

B. $(p + r)^2 = q^2 - r^2$

C. $p^2 + q^2 - 2pr = 0$

D. $(p - r)^2 = q^2 + r^2$

Answer: A

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27. 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.

A. $f'(x)$

B. $f''(x)$

C. $f'''(x)$

D. none of these

Answer: A

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28. 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.

A. $f^{m}(x)$

B. $f^{m-1}(x)$

C. $f''(x)$

D. none of these

Answer: B

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29. If a and b are two distinct real roots of the polynomial $f(x)$ such that $a < b$, then there exists a real number c lying between a and b, such that

A. $f(c) - 0$

B. $f'(c) = 0$

C. $f''(c) = 0$

D. none of these

Answer: B

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30. If $ax^3 + bx - c$ is divisible by $x^2 + bx + c$, then 'a' is a root of the equation

A. $cx^2 - bx - 1 = 0$

B. $ax^2 - bx - 1 = 0$

C. $bx^2 - ax - 1 = 0$

D. none of these

Answer: A

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31. If α, β are the roots of $x^2 + px + q = 0 and x^{2n} + p^n x^n + q^n = 0 and if (\alpha / \beta), (\beta / \alpha)$ 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

A. an odd integer

B. an even integer

C. any integer

D. none of these

Answer: B

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32. Root (s) of the equation $9x^2 - 18|x| + 5 = 0$ belonging to the domain of definition of the function $f(x) = \log(x^2 - x - 2)$ is/are :

A. $\frac{-5}{3}, \frac{-1}{3}$

B. $\frac{5}{3}, \frac{1}{3}$

C. $\frac{-5}{3}$

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

Answer: C

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33. If $x = 1 + i$ is a root of the equation $= x^3 - ix + 1 - i = 0,$ then the other real root is 0 b. 1 c. -1 d. none of these

A. 1

B. -1

C. 0

D. none of these

Answer: B

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34. 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 $\alpha < \gamma < \beta.$

A. $y = \frac{\alpha + \beta}{2}$

B. $y = \alpha + \frac{\beta}{2}$

C. $y = \alpha/2 + \beta$

D. $\alpha < y < \beta$

Answer: D

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35. 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. one positive and one negative root two positive roots two negative roots cannot say anything

A. two real roots

B. two negative roots

C. two positive roots

D. one positive and one negative roots

Answer: A

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36. The equation $(\cos p - 1)^{x} \hat{} 2 + (\cos p)x + s \in p = 0$ in the variable x has real roots. The p can take any value in the interval $(0, 2\pi)$ (b) $(- \pi)$ (c) $\left(- \frac{\pi}{2}, \frac{\pi}{2} \right)$ (d) $(, \pi)$

A. $(0, 2\pi)$

B. $(- \pi, 0)$

C. $\left(- \frac{\pi}{2}, \frac{\pi}{2} \right)$

D. $(0, \pi)$

Answer: D

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37. The number of real solution of the equation. $\sin(e^{x}) = 5^{x} + 5^{-x}$ is

A. 0

B. 1

C. 2

D. infinitely many

Answer: A

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38. Suppose that $f(x)$ is a quadratic expresson positive for all real x. If $g(x) = f(x) + f'(x) + f''(x)$, then for any real $x(where f'(x) and f''(x)$ represent 1st and 2nd derivative, respectively).

a. $g(x) < 0$ b. $g(x) > 0$ c. $g(x) = 0$ d. $g(x) \geq 0$

A. $g(x) < 0$

B. $g(x) > 0$

C. $g(x) = 0$

D. $g(x) \geq 0$

Answer: B

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

A. $(x-c)(x-d)-k=0$

B. $(x-c)(x-d)+k=0$

C. $(x-a)(x-c)+k=0$

D. $(x-b)(x-d)+k=0$

Answer: B

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40. Show that A.M. of the roots of $x^2-2ax+b^2=0$ is equal to the G.M. of the roots of the equation $x^2-2bx+a^2=0$ and vice- versa.

A. $A > G$

B. $A \neq G$

C. $A = G$

D. none of these

Answer: C

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41. If α, β are the roots of the quadratic equation $x^2 + px + q = 0$ and γ, δ are the roots of $x^2 + px - r = 0$ then $(\alpha - \gamma)(\alpha - \delta)$ is equal to :

A. p + q

B. q - r

C. r - q

D. q + r

Answer: D

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42. 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, then the product of the roots is :

A. $\frac{1}{2}(a^2+b^2)$

B. $-\frac{1}{2}(a^2+b^2)$

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

D. $-\frac{1}{2}ab`$

Answer: B

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43. If the ratio of the roots of the equation $x^2+px+q=0$ is equal to the ratio of the roots of $x^2+lx+m=0$, prove that $mp^2=ql^2$.

A. $p^2m = q^2l$

B. $\pm^2 = q^2l$

C. $p^2l = q^2m$

D. $p^2m = l^2q$

Answer: D

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44. 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.

A. -4

B. 0

C. 4

D. 2

Answer: C

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45. If $x^2 - 3x + 2$ is a factor of $x^4 - px^2 + q = 0, $ then $p + q =$

A. 5, -4

B. 5, 4

C. $-5, 4$

D. $-5, \ -4$

Answer: B

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46. If the equations $x^2 + px + q = 0$ and $x^2 + p'x + q' = 0$ have a common root, then it must be equal to a. $\dfrac{p' - p'q}{q - q'}$ b. $\dfrac{q - q'}{p' - p}$ c. $\dfrac{p' - p}{q - q'}$ d. $\dfrac{pq' - p'q}{p - p'}$

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

B. $\frac{p + p'}{q + q'}$

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

D. $\frac{q + q'}{p + p'}$

Answer: C

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47. If the expression $x^2 - 11x + a$ and $x^2 - 14x + 2a$ have a common factor, then the values of 'a' are

A. 0, 24

B. 0, -24

C. 1, -1

D. $-2, 1$

Answer: A

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

A. A.P.

B. G.P.

C. H.P.

D. none of these

Answer: A

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49. Fill in the blanks If the quadratic equations $x^2 + ax + b = 0 and dx^2 + bx + a = 0 (a \ne b)$ have a common root, then the numerical value of $a + b$ is ______.

A. 1

B. 0

C. -1

D. none of these

Answer: C

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

A. $[2, 8]$

B. $[-2, 8]$

C. $[-8, 2]$

D. none of these

Answer: B

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

A. 0

B. 1

C. 2

D. 3

Answer: C

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52. If one root of the equation $(k-1)x^2 - 10x + 3 = 0$ is the reciprocal of the other, then the value of is__________ .

A. 4, -24

B. 4, 24

C. $-4, \ -24$

D. $-4, 24$

Answer: D

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53. If $b_1 . b_2 = 2(c_1 + c_2)$ then at least one of the equation $x^2 + b_1 x + c_1 = 0$ and $x^2 + b_2 x + c_2 = 0$ has a) imaginary roots b) real roots c) purely imaginary roots d) none of these

A. real roots

B. purely imaginary roots

C. imaginary roots

D. none of these

Answer: A

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54. Solve $\left|x^2+4x+3\right|+2x+5=0.$

A. $-4,\ -1-\sqrt{3}$

B. $4, 1+\sqrt{3}$

C. $-4, 1-\sqrt{3}$

D. $-4, 1+\sqrt{3}$

Answer: A

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55. For a $a\leq 0,$ determine all real roots of the equation $x^2-2a|x-a|-3a^2=0.$

A. $a(1-\sqrt{2}), a(-1+\sqrt{6})$

B. $a(1+\sqrt{2}), a(1-\sqrt{6})$

C. $a(1-\sqrt{2}), a(1-\sqrt{6})$

D. none of these

Answer: A

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56. If $2+\sqrt{3}i$ is a root of the equation $x^2+px+1=0$, then write the values of $p \, and \, q$.

A. $p=-4, q=7$

B. $p=4, q=7$

C. $p=4, q=-7$

D. $p=-4, q=-7$

Answer: A

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57. If $\tan\alpha \tan\beta$ are the roots of the equation $x^2 + px + q = 0 (p \neq 0)$ then

A. $\sin^2(\alpha+\beta) + p\sin(\alpha+\beta)\cos(\alpha+\beta) + q\cos^2(\alpha+\beta) = q$

B. $\tan(\alpha+\beta) = \dfrac{p}{q+1}$

C. $\cos(\alpha+\beta) = -p$

D. $\sin(\alpha+\beta) = 1 - q$

Answer: A

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58. Root of the quadratic equation $x^2 + 6x - 2 = 0$

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59. If sum of the roots of $ax^2 + bx + c = 0$ is equal to the sum of the squares of their reciprocals then show that $2a^2c = ab^2 + bc^2$.

A. $c^2b, a^2c, b^2aare \in A. P.$

B. $c^2b, a^2c, b^2aare \in G. P.$

C. $\frac{b}{c}, \frac{a}{b}, \frac{c}{a}are \in G. P.$

D. $\frac{a}{b}, \frac{b}{c}, \frac{c}{a}are \in G. P.$

Answer: A

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60. For real x, the function $(x - a)(x - b) / (x - c)$ will assume all real values provided $a > b > c$ b. `a c > bd. a

A. $a \leq c \leq b$

B. $b \geq a \geq c$

C. $b \leq c \leq a$

D. $a \geq b \geq c$

Answer: B

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61. If $a(p+q)^2 + 2bpq + c = 0$ and $a(p+r)^2 + 2bpr + c = 0 (a \neq 0)$, then which one is correct? a) $qr = p^2$ b) $qr = p^2 + \frac{c}{a}$ c) none of these d) either a) or b)

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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62. If the roots of the equation $ax^2 + 2bx + c = 0$ and $bx^2 - 2\sqrt{ac}x + b = 0$ are simultaneously real, then prove that $b^2 = ac$

A. a = b, c = 0

B. $ac = b^2$

C. $4b^2 = ac$

D. none of these

Answer: B

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63. If a, b, c are real and $x^3 - 3b^2x + 2c^3$ is divisible by x -a and x - b, then

(a) a =-b=-c (c) a = b = c or a =-2b-_ 2c (b) a = 2b = 2c (d) none of these

A. a = - b = - c

B. a = 2b = 2c

C. a = b = c or a = - 2b = -2c

D. none of these

Answer: C

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64. if p and q are non zero constants, the equation $x^2 + px + q = 0$ has roots α and β then the equation $qx^2 + px + 1 = 0$ has roots

A. $qx^2 + px + 1 = 0 \text{has roots} \frac{1}{u} \text{ and } \frac{1}{v}$

B. $(x - p)(x + q) = 0 \text{has roots} u + v \text{ and } uv$

C. $x^2 + p^2x + q^2 = 0 \text{has roots} u^2 \text{ and } v^2$

D. $x^2 + qx + p = 0 \text{has roots} \frac{u}{v} \text{ and } \frac{v}{u}$

Answer: A

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65. The equation $x^{\frac{3}{4}(\log_2 x)^2 + \log_2 x - \frac{5}{4}} = \sqrt{2}$ has :

A. has at least one real solution

B. has exactly three real solutions

C. has exactly one irrational solution

D. all of these

Answer: D

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66. $\cos\alpha$ is a root of the equation $25x^2 + 5x - 12 = 0, \ -1 < x < 0$, then the value of $\sin 2\alpha$ is:

A. $\frac{12}{25}$

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

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

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

Answer: C

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67. If $a+b+c=0$ then check the nature of roots of the equation $4ax^2+3bx+2c=0 where a, b, c \in R$.

A. one positive and one negative root

B. imaginary roots

C. real roots

D. none of these

Answer: C

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68. 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 $(b, +\infty)$

A. both roots in [a, b]

B. both roots in $(-\infty, a)$

C. roots in $(-\infty, a)$ and other in (b, ∞)

D. both roots in (b, ∞)

Answer: D

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69. If $a, b, c \varepsilon Q$ then roots of the equation $(b+c-2a)x^2+(c+a-2b)x+(a+b-2c)=0$ are

A. $a+b+c$ and $a-b+c$

B. $\frac{1}{2}$ and $a-2b+c$

C. $a-2b+c$ and $\frac{1}{a+b-c}$

D. none of these

Answer: D

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70. If a,b,c are positive real numbers, then the number of real roots of the equation $ax^2 + b|x| + c$ is

A. 2

B. 4

C. 0

D. none of these

Answer: C

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71. Real roots of equation $x^2 + 5|x| + 4 = 0$ are

A. $-1, \; -4$

B. 1, 4

C. $-4, 4$

D. none of these

Answer: D

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

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

B. $\frac{9}{4}$

C. $-\frac{9}{4}$

D. 1

Answer: C

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73. If f(x) = $\frac{x^2-2x+4}{x^2+2x+4}, x \in R$ then range of function is

A. $[1/3, 3]$

B. $(1/3, 3)$

C. (3, 3)

D. $(-1/3, 3)$

Answer: A

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74. If $a < c < b$ then the roots of the equation $(a-b)x^2+2(a+b-2c)x+1=0$ are

A. imaginary

B. real

C. one real and imaginary

D. equal and imaginary

Answer: A

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

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

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

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

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

Answer: D

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76. If α, β are roots of $ax^3 + bx + c = 0$ then the equation $ax^2 - bx(x-1) + c(x-1)^2 = 0$ has roots

A. $\dfrac{\alpha}{1-\alpha}, \dfrac{\beta}{1-\beta}$

B. $\dfrac{1-\alpha}{\alpha}, \dfrac{1-\beta}{\beta}$

C. $\dfrac{\alpha}{\alpha+1}, \dfrac{\beta}{\beta+1}$

D. $\dfrac{\alpha+1}{\alpha}, \dfrac{\beta+1}{\beta}$

Answer: C

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77. If $\alpha \neq \beta$ but $\alpha^2 = 5\alpha - 3$ and $\beta^2 = 5\beta - 3$ then the equation having α / β and β / α as its roots is :

A. $3x^2 + 19x + 3 = 0$

B. $3x^2 - 19x + 3 = 0$

C. $3x^2 - 19x - 3 = 0$

D. $x^2 - 16x + 1 = 0$

Answer: B

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78. The expression $y = ax^2 + bx + c$ has always the same sign as of a if $(A) 4ac < b^2 (B) 4ac > b^2 (C) 4ac = b2 (D) ac < b^2$

A. $4ac < b^2$

B. $4ac > b^2$

C. $ac < b^2$

D. $ac > b^2$

Answer: B

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

A. $x^3 - 8 = 0$

B. $x^3 - 16 = 0$

C. $x^3 + 64 = 0$

D. $x^3 - 64 = 0$

Answer: D

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80. Given that $ax^2 + bx + c = 0$ has no real roots and $a + b + c < 0$, then $c \neq 0$ b. $c < 0$ c. $c > 0$ d. $c = 0$

A. c = 0

B. $c > 0$

C. $c < 0$

D. c = 0

Answer: C

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81. If $x \in R$, then the expression $9^x - 3^x + 1$ assumes

A. all real values

B. all real values greater than 0

C. all real values greater than 3/4

D. all real values greater than 1/4

Answer: C

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82. The values of 'a' for which the roots of the equation $x^2 + x + a = 0$ are real and exceed 'a' are

A. $0 < a < 1/4$

B. $a < 1/4$

C. $a < -2$

D. $-2 < a < 0$

Answer: C

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

A. $x^2 = 0$

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

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

D. $x^2 - bx + 1 = 0$

Answer: C

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84. The roots α, β and γ of an equation $x^3 - 3ax^2 + 3bx - c = 0$ are in H.P. Then,

A. $\beta = \frac{1}{a}$

B. $\beta = b$

C. $\beta = \frac{b}{c}$

D. $\beta = \frac{c}{b}$

Answer: D

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85. If b and c are odd integers, then the equation $x^2 + bx + c = 0$ has-

A. two odd roots

B. two integer roots, one odd and one even

C. no integer roots

D. none of these

Answer: C

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86. 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.

A. $a = b \neq c$

B. $a = -b = c$

C. $a = b = c$

D. none of these

Answer: C

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87. If both the roots of the equation $ax^2 + bx + c = 0$ are zero, then

A. b = c = 0

B. $b = 0, c \neq 0$

C. $b \neq 0, c = 0$

D. none of these

Answer: A

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88. If $\alpha, \beta, \gamma, \delta$ are the roots of the equation $x^4 + x^2 + 1 = 0$ then the equation whose roots are $\alpha^2, \beta^2, \gamma^2, \delta^2$ is

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

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

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

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

Answer: B

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89. The number of real roots of $\left(x + \frac{1}{x}\right)^3 + x + \frac{1}{x} = 0$ is

A. 0

B. 2

C. 4

D. 6

Answer: A

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90. The roots of the equation $(3-x)^4+(2-x)^4=(5-2x)^4$ are

A. all real

B. all imaginary

C. two real and two imaginary

D. none of these

Answer: C

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91. The real roots of the equation $|x|^3-3x^2+3|x|-2=0$ are

A. 0, 2

B. ± 1

C. ± 2

D. 1, 2

Answer: C

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92. The number of positive integral roots of $x^4 + x^3 - 4x^2 + x + 1 = 0,$ is

A. 0

B. 1

C. 2

D. 4

Answer: C

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93. If x, y, z are real and distinct, then $x^2 + 4y^2 + x + 1 = 0$, is

A. non-negative

B. non-positive

C. zero

D. none of these

Answer: A

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94. 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

A. 2

B. -2

C. 0

D. none of these

Answer: B

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

C. c

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

Answer: A

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96. the values of a for which $(a^2-1)x^2+2(a-1)x+2$ is positive for all real x are.

A. $a \geq 1$

B. $a \leq 1$

C. $a > -3$

D. $a \leq -3$ or $a \geq 1$

Answer: D

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97. If α and β are the roots of the equation $x^2+\sqrt{\alpha}x+\beta=0$ then the values of α and β are -

A. $\alpha=1, \beta=-1$

B. $\alpha=1, \beta=-2$

C. $\alpha=2, \beta=1$

D. $\alpha = 2, \beta = -2$

Answer: B

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98. If a, b, c are in A.P. and if $(b-c)x^2 + + (c-a)x + a - b = 0$ and $2(c+a)x^2 + (b+c)x = 0$ have a common root, then

A. a^2, b^2, c^2 are in A.P.

B. a^2, c^2, b^2 are in A.P.

C. a^2, c^2, b^2 are in G.P.

D. none of these

Answer: B

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99. If the 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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100. The set of values of p for which the roots of the equation $3x^2 + 2x + p(p-1) = 0$ are of opposite signs is :

A. $(-\infty, 0)$

B. (0, 1)

C. $(1, \infty)$

D. $(0, \infty)$

Answer: B

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101. Let α and β, be the roots of the equation $x^2 + x + 1 = 0$. The equation whose roots are α^{19} and β^7 are:

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

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

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

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

Answer: D

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

A. p = 1

B. p = 1 or 0

C. p = -2

D. p = -2 or 0

Answer: B

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103. 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 $\left|\frac{r}{p} - 7\right| \geq 4\sqrt{3}$ b. $\left|\frac{p}{r} - 7\right| \geq 4\sqrt{3}$ c. $allpandr$ d. $nopandr$

A. $\left|\frac{r}{p} - 7\right| \geq 4\sqrt{3}$

B. $\left|\frac{p}{r} - 7\right| < 4\sqrt{3}$

C. all p and r

D. no p and r

Answer: A

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104. If two equation $a_1x^2 + b_1x + c_1 = 0$ and , $a_2x^2 + b_2x + c_2 = 0$ have a common root, then the value of $(a_1b_2 - a_2b_1)(b_1c_2 - b_2c_1)$, is

A. $-(a_1c_2 - a_2c_1)^2$

B. $(a_1a_2 - c_1c_2)^2$

C. $(a_1c_1 - a_2c_2)^2$

D. $(a_1c_2 - c_1a_2)^2$

Answer: D

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105. The value of p for which the difference between the roots of the equation $x^2 + px + 8 = 0$ is 2, are

A. ± 2

B. ± 4

C. ± 6

D. ± 8

Answer: C

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106. If $f(x) = 2x^3 + mx^2 - 13x + n$ and 2 and 3 are 2 roots of the equations f(x)=0, then values of m and n are

A. $-5, \ -30$

B. $-5, 30$

C. 5, 30

D. none of these

Answer: B

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

A. H.P.

B. G.P.

C. A.P.

D. none of these

Answer: A

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108. If $7^{\log 7\left(x^2-4x+5\right)}=x-1$, x may have values

A. 2, 3

B. 7

C. $-2, \ -3$

D. 2, -3

Answer: A

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109. If α, β are roots of $ax^2+bx+c=0,$ then the equatin whose roots are $2+\alpha, 2+\beta,$ is

A. $ax^2+x(4a-b)+4a-2b+c=0$

B. $ax^2+x(4a-b)+4a+2b+c=0$

C. $ax^2+x(b-4a)+4a+2b+c=0$

D. $ax^2+x(b-4a)+4a-2b+c=0$

Answer: D

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110. For the equation $\left|x^2\right| + |x| - 6 = 0$, the sum of the real roots is 1

(b) 0 (c) 2 (d) none of these

A. there is only one root

B. there are only two distinct roots

C. there are only three distinct roots

D. there are four distinct roots

Answer: B

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111. Q. Two students while solving a quadratic equation in x, one copied the constant term incorrectly and got the roots as 3 and 2. The other copied the constant term and coefficient of x^2 as -6 and 1 respectively.

The correct roots are :

A. 3, -2

B. $-3, 2$

C. $-6, \ -1$

D. 6, -1

Answer: D

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112. If 8, 2 are roots of the equation$x^2 + ax + \beta$and 3, 3 are roots of $x^2 + \alpha x + b = 0$ then roots of the equation $x^2 + ax + b = 0$ are

A. $8, \ -1$

B. $-9, 2$

C. $-8, \ -2$

D. 9, 1

Answer: D

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113. If one root of $x^2 - x - k = 0$ is square of the other, then k =

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

B. $3 \pm \sqrt{2}$

C. $2 \pm \sqrt{5}$

D. $5 \pm \sqrt{2}$

Answer: C

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114. If a and b are the odd integers, then the roots of the equation, $2ax^2 + (2a + b)x + b = 0, a \neq 0$, will be

A. rational

B. irrational

C. non-real

D. none of these

Answer: A

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115. Find the values of p for which both the roots of the equation $4x^2 - 20px + \left(25p^2 + 15p - 66\right) = 0$ are less than 2.

A. $(4/5, 2)$

B. $(-1, -4/5)$

C. $(2, \infty)$

D. $(-\infty, -1)$

Answer: D

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116. The value of 'c' for which $|\alpha^2 - \beta^2| = 7/4$, where α and β are the roots of $2x^2 + 7x + c = 0$, is

A. 4

B. 0

C. 6

D. 2

Answer: C

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117. The value of 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

A. 1

B. -2

C. 2

D. none of these

Answer: B

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118. The equations $ax^2 + bz + a = 0$, $x^3 - 2x^2 + 2x - 1 = 0$ have tow roots common, then find the value of a+b.

A. 1

B. -1

C. 0

D. none of these

Answer: C

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119. The graph of the function $y = 16x^2 + 8(a+5)x - 7a - 5$ is strictly above the x axis, then 'a' must satisfy the inequality

A. $-15 < a < -2$

B. $-2 < a < -1$

C. $5 < a < 7$

D. none of these

Answer: A

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

A. 2

B. 4

C. 6

D. none of these

Answer: B

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121. The number of real roots of the equation $2x^4+5x^2+3=0$, is

A. 4

B. 1

C. 0

D. 3

Answer: C

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122. If x, a, b, c are real and $(x-a+b)^2+(x-b+c)^2=0$, then a, b, c are in

A. H.P.

B. G.P.

C. A.P.

D. none of these

Answer: C

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123. If the roots of the equation $(a^2+b^2)x^2-2b(a+c)x+(b^2+c^2)=0$ are equal, then (a)$2b = a + c$ (b) $b^2 = ac$ (c) $b = \frac{2ac}{a + c}$ (d) $b = ac$

A. G.P.

B. A.P.

C. H.P.

D. none of these

Answer: A

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124. If a, b, c are all positive and in HP, then the roots of $ax^2 + 2bx + c = 0$ are

A. real

B. imaginary

C. rational

D. equal

Answer: B

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125. If the equation $ax^2 + 2bx - 3c = 0$ has no real roots and $\left(\frac{3c}{4}\right) < a + b,$ then -

A. $c < 0$

B. $c > 0$

C. $c \geq 0$

D. $c = 0$

Answer: A

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126. If the roots of the equation $x^2 + 2ax + b = 0$ are real and distinct and they differ by at most $2m, thenb$ lies in the interval $\left(a^2, a^2, + m^2\right)$

b. $(a^2 - m^2, a62)$ c. $[a^2 - m^2, a^2)$ d. none of these

A. $(a^2 - m^2, a^2)$

B. $[a^2 - m^2, a^2]$

C. $(a^2, a^2 + m^2)$

D. none of these

Answer: B

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127. $\begin{vmatrix} 1 & \cos(\alpha - \beta) & \cos\alpha \\ \cos(\alpha - \beta) & 1 & \cos\beta \\ \cos\alpha & \cos\beta & 1 \end{vmatrix}$

A. $\sin(\alpha + \beta)$

B. $\sin\alpha \sin\beta$

C. $1 + \cos(\alpha + \beta)$

D. none of these

Answer: D

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128. Let $\alpha$and β be the roots of the equation $ax^2+bx+c=0. Let S_n=\alpha^n+\beta^n \text{for} n \geq$ 1. Evaluate the determinant

$$\begin{vmatrix} 3 & 1+S_1 & 1+S_2 \\ 1+S_1 & 1+S_2 & 1+S_3 \\ 1+S_2 & 1+S_3 & 1+S_4 \end{vmatrix}$$

A. $\dfrac{b^2-4nc}{a^4}$

B. $\dfrac{(a+b+c)\left(b^2+4ac\right)}{a^4}$

C. $\dfrac{(a+b+c)\left(b^2-4ac\right)}{a^4}$

D. $\dfrac{(a+b+c)^2\left(b^2-4ac\right)}{a^4}$

Answer: D

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129. if$a = \cos(2\pi/7) + i\sin(2\pi/7)$, then find the quadratic equation whose roots are $\alpha = a + a^2 + a^4$and $\beta = a^3 + a^5 + a^6$.

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

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

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

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

Answer: D

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130. The integral value of 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] n^2 b. $n(n+2)$ c. $n(n+1)$ d. none of these

A. $n(n+2), n \in Z$

B. $n(n+1), n \in Z$

C. $n(n-2), n \in Z$

D. none of these

Answer: B

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131. If $(1+k)\tan^2 x - 4\tan x - 1 + k = 0$ has real roots, then which one of the following is not true?

A. $k^2 \leq 5$

B. $k^2 \geq 6$

C. $k = 3$

D. none of these

Answer: A

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132. If the sum of squares of roots of equation $x^2 - (\sin\alpha - 2)x - (1 + \sin\alpha) = 0$ is the least, then α is equal to

A. $\pi/4$

B. $\pi/3$

C. $\pi/2$

D. $\pi/6$

Answer: C

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133. p, q, r and s are integers. If the A.M. of the roots of $x^2 - px + q^2 = 0$ and G.M. of the roots of $x^2 - rx + s^2 = 0$ are equal, then

A. q is an odd integer

B. r is an even integer

C. p is an even integer

D. s is an odd integer

Answer: C

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134. If α, β, γ be the roots of $x^3 + a^3 = 0 (a \in R)$, then the number of equation(s) whose roots are $\left(\frac{\alpha}{\beta}\right)^2$ and $\left(\frac{\alpha}{\gamma}\right)^2$, is

A. 1

B. 2

C. 3

D. 6

Answer: A

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

A. α^{-1}, β^{-1}

B. α^2, β^2

C. $\alpha\beta^{-1}, \alpha^{-1}\beta$

D. $\sqrt{\alpha}, \sqrt{\beta}$

Answer: B

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136. If the equations $2x^2 - 7x + 1 = 0$ and $ax^2 + bx + 2 = 0$ have a common root, then

A. $a = 2, b = -7$

B. $a = -\frac{7}{2}, b = 1$

C. $a = 4, b = -14$

D. none of these

Answer: C

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137. The common roots of the equation $x^3 + 2x^2 + 2x + 1 = 0$ and $1 + x^{2008} + x^{2003} = 0$ are (where ω is a complex cube root of unity)

A. ω, ω^2

B. $1, \omega^2$

C. $-1, -\omega$

D. $\omega, -\omega^2$

Answer: A

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138. If $f(x) = \sum_{k=2}^{n}\left(x - \frac{1}{k-1}\right)\left(x - \frac{1}{k}\right)$, then the product of root of f(x) = 0 as $n \to \infty$, is

A. -1

B. 0

C. 1

D. none of these

Answer: B

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Chapter Test

1. The set of values of a for which $x^2 + ax + \sin^{-1}(x^2 - 4x + 5) + \cos^{-1}(x^2 - 4x + 5) = 0$ has at least one real root is given by

A. $\left(-\infty, -\sqrt{2\pi}\right] \cup \left[\sqrt{2\pi}, \infty\right)$

B. $\left(-\infty, -\sqrt{2\pi}\right) \cup \left(\sqrt{2\pi}, \infty\right)$

C. R

D. None of these

Answer: A

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2. The set of possible values of λ for which $x^2 - (\lambda^2 - 5\lambda + 5)x + (2\lambda^2 - 3\lambda - 4) = 0$ has roots whose sum and product are both less than 1 is

A. $(-1, 5/2)$

B. $(1, 4)$

C. $[1, 5/2]$

D. $(1, 5/2)$

Answer: D

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3. The equation $(a+2)x^2 + (a-3)x = 2a - 1, a \neq -2$ has roots rational for

A. all rational values of a except a = -2

B. all real values of a except a = - 2

C. rational values of $a > 1/2$

D. none of these

Answer: A

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4. If $\cos\alpha, \sin\beta, \sin\alpha$ are in increasing G.P. , then roots of $x^2 + 2\cot\beta, x + 1 = 0$ are (where $\alpha, \beta \in R$)

A. equal

B. real

C. imanginary

D. greater than 1

Answer: B

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5. If α, β are roots of `x^2-3x+a=0,a in Ra n dalpha<1

A. $a \in (-\infty, 2)$

B. $a \in (-\infty, 9/4]$

C. $a \in (2, 9/4]$

D. none of these

Answer: A

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6. If the equations $ax^2 + bx + c = 0$ and $cx^2 + bx + a = 0, a \neq c$ have a negative common root then the value of $a - b + c =$

A. 0

B. 2

C. 1

D. none of these

Answer: A

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7. If the roots of the equation $x^3 - 12x^2 + 39x - 28 = 0$ are in AP, then their common difference is

A. ± 1

B. ± 2

C. ± 3

D. ± 4

Answer: C

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8. If the roots of $a_1x^2 + b_1x + c_1 = 0$ are α_1, β_1 and those of $a_2x^2 + b_2x + c_2 = 0$ are α_2, β_2 such that $\alpha_1\alpha_2 = \beta_1\beta_2 = 1$ then

A. $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

B. $\frac{a_1}{c_2} = \frac{b_1}{b_2} = \frac{c_1}{a_2}$

C. $a_1a_2 = b_1b_2 = c_1c_2$

D. none of these

Answer: B

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9. If the roots of the equation $ax^2 - 4x + a^2 = 0$ are imaginery and the sum of the roots is equal to their product then a is

A. -2

B. 4

C. 2

D. none of these

Answer: C

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10. If a, b, c are positive real numbers, then the roots of the equation $ax^2 + bx + c = 0$

A. are real and are in ratio b : ac

B. are real

C. are imaginary and are in ratio $1:\omega$, where ω is a complex cube root of unity

D. are imaginary and are in ratio $-1:\omega$

Answer: C

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11. If the absolute value of the difference of the roots of the equation $x^2+ax+1=0\text{exceeds}\sqrt{3a}$, then

A. $a \in (-\infty, -1) \cup (4, \infty)$

B. $a \in (4, \infty)$

C. $a \in (-1, 4)$

D. $a \in [0, 4)$

Answer: A

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12. If α, β be roots of the equation $375x^2 - 25x - 2 = 0$ and $s_n = \alpha^n + \beta^n$, then $\lim_{x \to \infty} \lim_{x \to \infty} \left(\sum_{r=1}^{n} S_r\right) =$

A. $7/116$

B. $1/12$

C. $29/348$

D. none of these

Answer: C

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13. The quadratic equation $x^2 + (a^2 - 2)x - 2a^2$ and $x^2 - 3x + 2 = 0$ have

A. no common root for all $a \in R$

B. exactly one common root for all $a \in R$

C. two common roots for some $a \in R$

D. none of these

Answer: B

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14. The roots of $ax^2 + bx + c = 0$ whose $a \neq 0, b, c \in R,$ " are non-real complex and " a + c lt b, " then

A. $ac > 0$

B. $ab > 0$

C. $bc > 0$

D. exactly two of ab, bc and ca are positive

Answer: A

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15. The value of m for which the equation $x^3 - mx^2 + 3x - 2 = 0$ has two roots equal rea magnitude but opposite in sign, is

A. $4/5$

B. $3/4$

C. $2/3$

D. $1/2$

Answer: C

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16. If the equation formed by decreasing each root of the $ax^2 + bx + c = 0$ by 1 $2x^2 + 8x + 2 = 0$. Find the condition.

A. a = - b

B. b = - c

C. c = - a

D. b = a + c

Answer: B

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17. If the roots of the equation $ax^2 - bx - c = 0$ are changed by same quantity then the expression in a,b,c that does not change is

A. $\dfrac{b^2 - 4ac}{a^2}$

B. $\dfrac{b - 4c}{a}$

C. $\dfrac{b^2 + 4ac}{a^2}$

D. $\dfrac{b^2 - 4ac}{a}$

Answer: C

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18. If $x^2 - 2rp_r x + r = 0; r = 1, 2, 3$ are three quadratic equations of which each pair has exactly one root common, then the number of solutions of the triplet (p_1, p_2, p_3) is

A. 1

B. 2

C. 9

D. 27

Answer: B

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19. If $x^2 + px + 1$ is a factor of $ax^3 + bx + c$, then:

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

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

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

D. none of these

Answer: C

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20. If $(x-1)^3$ is a factor of $x^4+ax^3+bx^2+cx-1=0$ then the other factor is

A. x - 3

B. x + 1

C. x + 2

D. x - 1

Answer: B

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21. 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.

A. $3\alpha^3 - 4\alpha$

B. $-2\alpha(\alpha + 1)$

C. $4\alpha^3 - 3\alpha$

D. none of these

Answer: C

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22. If one root of the quadratic equation $(a - b)x^2 + ax + 1 = 0$ is double the other root where $a \in R$, then the greatest value of b is

A. $9/8$

B. $7/8$

C. $8/9$

D. $8/7$

Answer: A

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23. If the equation $ax^2 + bx + c = 0$ and $2x^2 + 3x + 4 = 0$ have a common root, then a : b : c

A. $2:3:4$

B. $1:2:3$

C. $4:3:2$

D. none of these

Answer: A

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24. If the equation $x^3 + ax^2 + b = 0, b \neq 0$ has a root of order 2, then

A. $a^2 + 2b = 0$

B. $a^2 - 2b = 0$

C. $4a^3 + 27b + 1 = 0$

D. $4a^3 + 27b = 0$

Answer: D

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25. If the roots of the equation $x^2 - bx + c = 0$ are two consecutive integers, them find the value of $b^2 = 4c$

A. 1

B. 0

C. 2

D. none of these

Answer: A

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26. 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.

A. $a = b \neq c$

B. $a = b = -c$

C. $a = b = c$

D. none of these

Answer: C

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27. Let S denote the set of all real values of a for which the roots of the equation $x^2 - 2ax + a^2 - 1 = 0$ lie between 5 and 10, then S equals

A. $(-1, 2)$

B. (2, 9)

C. (4, 9)

D. (6, 9)

Answer: D

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

A. 4

B. 3

C. 2

D. 10

Answer: A

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29. The twice of the product of real roots of the equation $(2x+3)^2 - 3|2x+3| + 2 = 0$ is ________

A. `5//4

B. $5/2$

C. 5

D. 2

Answer: B

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

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

A. real and unequal

B. real and equal

C. imaginary

D. none of these

Answer: A

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31. If $\sec\alpha, \tan\alpha,$ are roots of $ax^2+bx+c=0$, then

A. $a^2-b^2+2ac=0$

B. $a^3+b^3+c^3-2abc=0$

C. $a^4+4ab^2c=b^4$

D. none of these

Answer: C

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32. If the roots of the equation $x^3 + bx^2 + 3x - 1 = 0$ form a non-decreasing H.P., then

A. $b \in (-3, \infty)$

B. $b = -3$

C. $b \in (-\infty, -3)$

D. none of these

Answer: B

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33. Let $[x]$ denote the greatest integer less than or equal to x. Then, $\int_0^{1.5} [x] dx = ?$

A. 6

B. 4

C. 1/2

D. 0

Answer: C

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34. the number of non-zero solutions of the equation $x^2 - 5x - (sgn x)6 = 0$ is.

A. 1

B. 2

C. 3

D. 4

Answer: A

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35. Find 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.

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

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

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

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

Answer: B

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36. If α, β, γ are the roots of the equation $x^3 + ax^2 + bx + c = 0, \text{then} \alpha^{-1} + \beta^{-1} + \gamma^{-1} =$

A. $\frac{a}{c}$

B. $-\frac{b}{c}$

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

D. $\frac{c}{a}$

Answer: B

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37. If α, β and γ are the roots of $x^3 + qx + r = 0$ then $\sum \frac{\alpha}{\beta + \gamma}$, is (i) 3 (ii)$q + r$ (iii)$\frac{q}{r}$ (iv) -3

A. 3

B. q+r

C. q/r

D. -3

Answer: D

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38. If α, β are the roots of the equation $ax^2 + bx + c = 0$ then the value of $(1 + \alpha + \alpha^2)(1 + \beta + \beta^2)$ is

A. 0

B. positive

C. negative

D. none of these

Answer: B

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

A. $p^2 - q^2$

B. $q^2 - p^2$

C. p^2

D. q^2

Answer: B

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40. The maximum number of real roots of the equation $x^{2n} - 1 = 0$, is

A. 2

B. 3

C. n

D. 2n

Answer: A

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41. The integral value of k for which the roots of the equation $(x-2)x^2+8x+k+4=0$ are real , distinct and negative is :

A. 0

B. 2

C. 3

D. -4

Answer: C

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42. If $x^{2/3} - 7x^{1/3} + 10 = 0$, then the set of values of x, is

A. {12, 5}

B. {8}

C. ϕ

D. {8, 125}

Answer: D

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43. If $x^2 + 2ax + 10 - 3a > 0$ for all $x \in R$ then

A. $-5 < a < 2$

B. $a < -5$

C. $a > 5$

D. $2 < a < 5$

Answer: A

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

A. $a + b + 4 = 0$

B. $a + b - 4 = 0$

C. $a - b - 4 = 0$

D. $a - b + 4 = 0$

Answer: A

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45. Product of real roots of the equation $t^2x^2 + |x| + 9 = 0$ a. is always +ve b. is always-ve c. does not exist d. none of these

A. is always positive

B. is always negative

C. does not exist

D. none of these

Answer: D

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

A. 0

B. 2

C. -1

D. 1

Answer: D

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

A. 10

B. 20

C. 30

D. 40

Answer: D

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

Answer: D

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49. If α and β are the roots of the equation $x^2-ax+b=0$ and $A_n=\alpha^n+\beta^n$, then which of the following is true ?

A. $A_{n+1}=aA_n+bA_{n-1}$

B. $A_{n+1}=bA_n+aA_{n-1}$

C. $A_{n+1}=aA_n-bA_{n-1}$

D. $A_{n+1}=bA_n-aA_{n-1}$

Answer: C

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

A. $4 - \frac{2b}{a} + \frac{c}{a} < 0$

B. $4 + \frac{2b}{a} - \frac{c}{a} < 0$

C. $4 - \frac{2b}{a} + \frac{c}{a} = 0$

D. $4 + \frac{2b}{a} + \frac{c}{a} = 0$

Answer: A

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