MATHS

BOOKS - SAI MATHS (TELUGU ENGLISH)

QUADRATIC EXPRESSIONS AND THEORY OF EQUATIONS

Problems

1. Let $\alpha \neq \beta$ satisfy $\alpha^2 + 1 = 6\alpha, \beta^2 + = 6\beta$. Then, the quadratic equation whose roots are $\frac{\alpha}{\alpha+1}, \frac{\beta}{\beta+1}$ is

A. $8x^2 + 8x + 1 = 0$

B. $8x^2 - 8x - 1 = 0$

C. $8x^2 + 8x + 1 = 0$

D. $8x^2 + 8x - 1 = 0$

Answer: C

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2. The set of solutions of $|x|^2 - 5|x| + 4 < 0$ is

A. $(-4, -1)$

B. $(1, 4)$

C. $(-4, -1) \cup (1, 4)$

D. $(-4, 4)$

Answer: C

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3. Let α, β, γ be the roots of $x^3 + x + 10 = 0$. Write $\alpha_1 = \frac{\alpha + \beta}{\alpha^2}, \beta_1 = \frac{\beta + \gamma}{\alpha^2}, \gamma_1 = \frac{\gamma + \alpha}{\beta^2}$. Then the value of $\left(\alpha_1^3 + \beta_1^3 + \gamma_1^3\right) - \frac{1}{10}\left(\alpha_1^2 + \beta_1^2 + \gamma_1^2\right)$ is

A. $\frac{1}{10}$

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

C. $\frac{3}{10}$

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

Answer: C

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4. Suppose α, β, γ are the roots of $x^3 + x^2 + x + 2 = 0$. Then the value of $\left(\frac{\alpha + \beta - 2\gamma}{\gamma}\right)\left(\frac{\beta + \gamma - 2\alpha}{\alpha}\right)\left(\frac{\gamma + \alpha - 2\beta}{\beta}\right)$ is

A. $-\frac{47}{2}$

B. $\frac{47}{2}$

C. -47

D. 47

Answer: A

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5. In the ΔABC, the value of $\angle A$ is obtained from the equation $3\cos A + 2 = 0$. The quadratic equation, whose roots are $\sin A$ and $\tan A$, is

A. $3x^2 + \sqrt{5}x - 5 = 0$

B. $6x^2 - \sqrt{5}x - 5 = 0$

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

D. $6x^2 + \sqrt{5}x + 5 = 0$

Answer: C

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6. If a, b, c are distinct and the roots of $(b-c)x^2 + (c-a)x + (a-b) = 0$ are equal, then a, b, c are in

A. Arithmetic progression

B. Geometric progression

C. Harmonic progression

D. Arithmetico-gemetric progression

Answer: A

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7. If the roots of $x^3 - kx^2 + 14x - 8 = 0$ are in geometric progression, then $k =$

A. -3

B. 7

C. 4

D. 0

Answer: B

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

A. 2

B. 3

C. $4 - \sqrt{5}$

D. $4 + \sqrt{5}$

Answer: C

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9. The range of $\frac{x^2 + 2x + 1}{x^2 + 2x - 1}$ is

A. $(-\infty, 0) \cup (1, \infty)$

B. $\left[\frac{1}{2}, 2\right]$

C. $\left[-\infty, \frac{-2}{9}\right] \cup (1, \infty)$

D. $(-\infty, 6) \cup (-2, \infty)$

Answer: A

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10. If x_1 and x_2 are the real roots of the equation $x^2 - kx + c = 0$, then the distance between the points $A(x_1, 0)$ and $B(x_2, 0)$ is

A. $\sqrt{k^2 + 4c}$

B. $\sqrt{k^2 - c}$

C. $\sqrt{c - k^2}$

D. $\sqrt{k^2 - 4c}$

Answer: D

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11. If x is real, then the minimum value of $y = \dfrac{x^2 - x + 1}{x^2 + x + 1}$ is

A. 3

B. $\dfrac{1}{3}$

C. $\dfrac{1}{2}$

D. 2

Answer: B

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12. p and q are distinct prime numbers and if the equation $x^2 - px + q = 0$ has positive integer as its roots then the roots the roots of the equation are

A. 1, -1

B. 2, 3

C. 1, 2

D. 3, 1

Answer: C

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13. The cubic equation whose roots are the squares of the roots of $x^3 - 2x^2 + 10x - 8 = 0$ is

A. $x^3 + 16x^2 + 68x - 64 = 0$

B. $x^3 + 8x^2 + 68x - 64 = 0$

C. $x^3 + 16x^2 - 68x - 64 = 0$

D. $x^3 - 16x^3 + 68x - 64 = 0$

Answer: A

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

A. 2

B. 3

C. $4-\sqrt{5}$

D. $4+\sqrt{5}$

Answer: D

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15. The set of solutions satisfying both $x^2+5x+6 \geq 0$ and $x^2+3x-4<0$ is

A. $(-4, 1)$

B. $(-4, -3] \cup [-2, 1)$

C. $(-4, -3) \cup (-2, 1)$

D. $[-4, -3] \cup [-2, 1]$

Answer: B

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16. If the roots of $x^3 - 42x^2 + 336x - 512 = 0$, are in increasing geometric progression, its common ratio is

A. $2:1$

B. $3:1$

C. $4:1$

D. $6:1$

Answer: C

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17. If α and β are the roots of the equation $x^2 - 2x + 4 = 0$, then $\alpha^9 + \beta^9 =$

A. -2^8

B. 2^9

C. -2^{10}

D. 2^{10}

Answer: C

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18. In a triangle $PQR \angle R = \frac{\pi}{4}$, if $\tan\left(\frac{p}{3}\right)$ and $\tan\left(\frac{Q}{3}\right)$ are the roots of the equation $ax^2 + bx + c = 0$ then

A. $a + b = c$

B. $b + c = 0$

C. $a + c = 0$

D. $b = c$

Answer: A

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19. The product of real roots of the equation $|x|^{6/5} - 26|x|^{3/5} - 27 = 0$ is

A. -3^{10}

B. -3^{12}

C. $-3^{12/5}$

D. $-3^{21/5}$

Answer: A

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20. If α, β and γ are the roots of the equation $x^3 + px^2 + qx + r = 0$, then the coefficient of x in the cubic equation whose roots are $\alpha(\beta + \gamma), \beta(\gamma + \alpha)$ and $\gamma(\alpha + \beta)$ is

A. 2q

B. $q^2 + pr$

C. $p^2 - qr$

D. $r(pq - r)$

Answer: B

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21. Let $A = \begin{vmatrix} 2 & e^{i\pi} \\ -1 & i^{2012} \end{vmatrix}, C = \frac{d}{dx}\left(\frac{1}{x}\right)_{x=1}, D = \int_{e^2}^{1} \frac{dx}{x}$. . If the sum of two roots of the equation $Ax^3 + Bx^2 + Cx - D = 0$ is equal to zero, then B is equal to

A. -1

B. 0

C. 1

D. 2

Answer: D

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22. if $a > 0$ and $b^2 - 4ac = 0$, then the curve $y = ax^2 + bx + c$

A. cuts of x-axis

B. touches the x-axis and lies below it

C. lies entirely above the x-axis

D. touches the x-axis and lies above it

Answer: D

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23. If $\tan A$ and $\tan B$ are the roots of the quadratic equation $x^2 - px + q = 0$, then $\sin^2(A + B)$ is equal to

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

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

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

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

Answer: D

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24. The value of a for which the equations $x^3 + ax + 1 = 0$ and $x^4 + ax^2 + 1 = 0$ have a common root is

A. -2

B. -1

C. 1

D. 2

Answer: A

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25. If x is real, then the value of $\frac{x^2 - 3x + 4}{x^2 + 3x + 4}$ lies in the interval

A. $\left[\frac{1}{3}, 3\right]$

B. $\left[\frac{1}{5}, 5\right]$

C. $\left[\frac{1}{6}, 6\right]$

D. $\left[\frac{1}{7}, 7\right]$

Answer: D

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26. For $x \in R$, the least value of $\frac{x^2 - 6x + 5}{x^2 + 2x + 1}$ is

A. -1

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

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

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

Answer: D

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27. $\left\{x \in R : \frac{14x}{x+1} - \frac{9x-30}{x-4} < 0\right\}$ is equal to

A. $(-1, 4)$

B. $(1, 4) \cup (5, 7)$

C. $(1, 7)$

D. $(-1, 1) \cup (4, 6)$

Answer: D

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28. The condition that the roots of $x^3 - bx^2 + cx - d = 0$ are in geometric progression is

A. $c^3 = b^3 d$

B. $c^2 = b^2 d$

C. $c = bd^3$

D. $c = bd^2$

Answer: A

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29. Let $\alpha \neq 1$ be a real root of the equation $x^3 - ax^2 + ax - 1 = 0$, where $a \neq -1$ is a real number. Then, a root of this equation, among the following, is

A. α^2

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

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

D. $-\frac{1}{\alpha^2}$

Answer: C

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30. The root of

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

are always

A. equal

B. imaginary

C. real and distinct

D. rational and equal

Answer: C

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31. Let $f(x) = x^2 + ax + b$, where $a, b \in R$. If $f(x) = 0$ has all its roots imaginary, then the roots of $f(x) + f'(x) + f''(x) = 0$ are

A. real and distinct

B. imaginary

C. equal

D. rational and equal

Answer: B

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32. If α, β, γ are the roots of $x^3 + 4x + 1 = 0$, then the equation whose roots are $\frac{\alpha^2}{\beta+\gamma}, \frac{\beta^2}{\gamma+\alpha}, \frac{\gamma^2}{\alpha+\beta}$ is

A. $x^3 - 4x - 1 = 0$

B. $x^3 - 4x + 1 = 0$

C. $x^3 + 4x - 1 = 0$

D. $x^3 + 4x + 1 = 0$

Answer: C

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33. If $f(x) = 2x^4 - 13x^2 + ax + b$ is divisible by $x^2 - 3x + 2$, then (a, b) is equal to

A. $(-9, -2)$

B. (6, 4)

C. (9, 2)

D. (2, 9)

Answer: C

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34. If α and β are the roots of $x^2 - 2x + 4 = 0$, then the value of $\alpha^6 + \beta^6$ is

A. 32

B. 64

C. 128

D. 356

Answer: C

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35. Let α and β be the roots of quadratic equation $ax^2 + bx + c = 0$.

Match the following columns and choose the correct answer.

Column I	Column II
(A) $\alpha+\beta$	(1) $\left(ac^2\right)^{1/3}+\left(a^2c\right)^{1/3}+b=0$
(B) $\alpha=2\beta$	(2) $2b^2=9ac$
(C) $\alpha=3\beta$	(3) $b^2=6ac$
(C) $\alpha=\beta^2$	(4) $3b^2=16ac$
	(5) $b^2=4ac$
	(6) $\left(ac^2\right)^{1/3}+\left(a^2c\right)^{1/3}=b$

A.

(A)	(B)	(C)	(D)
5	2	4	6

B.

(A)	(B)	(C)	(D)
5	2	1	4

C.

(A)	(B)	(C)	(D)
5	4	2	6

D.

(A)	(B)	(C)	(D)
5	2	4	1

Answer: D

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36. IF $\alpha+\beta$ =- 2 and alpha ^3 + beta ^3 =- 56 , $then the\ ratic equation whose \sqrt[3]{a}re$ alpha and beta ` is

A. $x^2+2x-16=0$

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

C. $x^2 + 2x - 12 = 0$

D. $x^2 + 2x - 8 = 0$

Answer: D

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37. The cubic equation, whose roots are thrice to each of the roots of $x^3 + 2x^2 - 4x + 1 = 0$ is

A. $x^3 - 6x^2 + 36x + 27 = 0$

B. $x^3 + 6x^2 + 36x + 27 = 0$

C. $x^3 - 6x^2 - 36x + 27 = 0$

D. $x^3 + 6x^2 - 36x + 27 = 0$

Answer: D

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38. The sum of the fourth powers of the roots of the equation $x^3 + x + 1 = 0$ is

A. -2

B. -1

C. 1

D. 2

Answer: D

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39. If α and β are roots of the equation $ax^2 + bx + c = 0$ and if $px^2 + qx + r = 0$ has roots $\frac{1-\alpha}{\alpha}$ and $\frac{1-\beta}{\beta}$, then r is equal to

A. $a + 2b$

B. $a + b + c$

C. $ab + bc + ca$

D. abc

Answer: B

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40. The set of values of x for which the inequalities $x^2 - 3x - 10 < 0, 10x - x^2 - 16 > 0$ hold simultaneously, is

A. (-2, 5)

B. (2, 8)

C. (-2, 8)

D. (2, 5)

Answer: D

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41. If 1, 2, 3 and 4 are the roots of the equation $x^4 + ax^3 + bx^2 + cx + d = 0$, then $a + 2b + c$ is equal to

A. -25

B. 0

C. 10

D. 24

Answer: C

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42. If α, β, γ are roots of $x^3 - 2x^2 + 3x - 4 = 0$, then the value of $\alpha^2\beta^2 + \beta^2\gamma^2 + \gamma^2\alpha^2$ is

A. -7

B. -5

C. -3

D. 0

Answer: A

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43. A quadratic equation whose roots are $\sin^2 18^\circ, \cos^2 36^\circ$ are

A. $16x^2 - 12x + 1 = 0$

B. $16x^2 + 12x + 1 = 0$

C. $16x^2 - 12x - 1 = 0$

D. None of the above

Answer: A

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44. If $\sqrt{9x^2 + 6x + 1} < 2 - x$, then

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

B. $x \in \left(\frac{-3}{2}, \frac{1}{4}\right]$

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

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

Answer: A

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45. The difference between two roots of the equation $x^3 - 13x^2 + 15x + 189 = 0$ is 2. then the roots of the equation are

A. $-3, 7, 9$

B. $-3, -7, -9$

C. $2, -5, 7$

D. $-3, -7, 9$

Answer: A

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46. If α, β, γ are the roots of the equation $x^3 - 6x^2 + 11x + 6 = 0$, then $\Sigma\alpha^2\beta + \Sigma\alpha\beta^2$ is equal to,

A. 80

B. 84

C. 90

D. -84

Answer: B

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47. The condition that sin θ cos θ may be the roots of $ax^2 + bx + c = 0$ is

A. Both I and II are true

B. I is true, II is false

C. I is false, II is true

D. Both I and II are false

Answer: A

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48. The roots of the equation $x^3 - 3x - 2 = 0$ are

A. $-1, -1, 2$

B. $-1, 1, -2$

C. $-1, 2, -3$

D. $-1, -1, -2$

Answer: A

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49. If α, β, γ are the roots of $x^3 + 2x^2 - 3x - 1 = 0$ then $\alpha^{-2} + \beta^{-2} + \gamma^{-2}$ is equal to

A. 12

B. 13

C. 14

D. 15

Answer: B

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50. If α is non real root of $x^6 = 1$, then $\frac{\alpha^5 + \alpha^3 + \alpha + 1}{\alpha^2 + 1}$ is equal to

A. α^2

B. 0

C. $-\alpha^2$

D. α

Answer: C

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51. If $(x-2)$ is a common factor of the expressions x^2+ax+b and x^2+cx+d, then $\frac{b-d}{c-a}$ is equal to

A. -2

B. -1

C. 1

D. 2

Answer: D

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52. If the roots of the equation $4x^3-12x^2+11x+k=0$ are in arithmetic progression, then k is equal to

A. -3

B. 1

C. 2

D. 3

Answer: A

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53. the set of all solutions of the inequation $x^2 - 2x + 5 \leq 0$ in R is

A. $R - (- \infty, \ - 5)$

B. $R - (5, \infty)$

C. ϕ

D. $R - (- \infty, \ - 4)$

Answer: C

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54. α, β, γ are the roots of the equation $x^3 - 10x^2 + 7x + 8 = 0$, Match the following columns and choose the correct answer.

Column I	Column II
A) $\alpha + \beta + \gamma$	1) $\frac{-43}{4}$
B) $\alpha^2 + \beta^2 + \gamma^2$	2) $\frac{-7}{8}$
C) $\frac{1}{\alpha} + \frac{1}{\beta} + \frac{1}{\gamma}$	3) 86
D) $\frac{\alpha}{\beta\gamma} + \frac{\beta}{\gamma\alpha} + \frac{\gamma}{\alpha+\beta}$	4) 0
	5) 10

A. (A) 5 (B) 3 (C) 1 (D) 2

B. (A) 4 (B) 3 (C) 1 (D) 2

C. (A) 5 (B) 3 (C) 2 (D) 1

D. (A) 5 (B) 2 (C) 3 (D) 1

Answer: A

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55. If $f(x)$ is a polynomial of degree 'n' with rational co-efficients and $1+2i, 2-\sqrt{3}$ and 5 are three roots of $f(x)=0$, then the least value of 'n' is

A. 5

B. 4

C. 3

D. 6

Answer: A

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56. The solution set contained in R of the inequation $3^x + 3^{1-x} - 4 < 0$, is

A. (1, 3)

B. (0, 1)

C. (1, 2)

D. (0, 2)

Answer: B

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57. If α, β, γ are the roots of the equation $x^3 + 4x + 1 = 0$, then $(\alpha + \beta)^{-1} + (\beta + \gamma)^{-1} + (\gamma + \alpha)^{-1}$ is equal to

A. 2

B. 3

C. 4

D. 5

Answer: C

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58. If the sum of the roots of $x^3 + px^2 - qx + r = 0$ is zero, then pq is equal to

A. $-r$

B. r

C. 2r

D. -2

Answer: A

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

A. x

B. $-x$

C. $-2x$

D. $2x$

Answer: B

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60. If the equations $x^2 + ax + b = 0$ and $x^2 + bx + a = 0 (a \neq b)$ have a common root, then $a + b$ is equal to

A. -1

B. 1

C. 3

D. 4

Answer: A

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61. If 3 is a root of $x^2 + kx - 24 = 0$, it is also a root of

A. $x^2 + 5x + k = 0$

B. $x^2 + kx + 24 = 0$

C. $x^2 - kx + 6 = 0$

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

Answer: C

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62. To remove the second term of the equation $x^4 - 8x^3 + x^2 - x + 3 = 0$, diminish the roots of the equation by

A. 1

B. 2

C. 3

D. 4

Answer: B

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63. The maximum possible number of real roots of the equation $x^5 - 6x^2 - 4x + 5 = 0$, is

A. 0

B. 3

C. 4

D. 5

Answer: B

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64. If α, β, γ are the roots of the equation $x^3 + ax^2 + bx + c = 0$, then $\alpha^{-1} + \beta^{-1} + \gamma^{-1}$ is equal to

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

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

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

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

Answer: C

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65. If $\frac{1+\sqrt{3}i}{2}$ is a root of the equation $x^4 - x^3 + x - 1 = 0$ then its real roots are,

A. 1, 1

B. $-1, -1$

C. 1, 2

D. 1, -1

Answer: D

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66. If α, β, γ are the roots of $2x^3 - 2x - 1 = 0$, $(\Sigma\alpha\beta)^2$ is equal to

A. $b + q$

B. $b - q$

C. $\frac{1}{2}(b + q$

D. $\frac{1}{2}(b - q)$

Answer: B

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67. If α, β are roots of the equation $x^2 + bx + c = 0$ and $\alpha + h, \beta + h$ are the roots of the equation $x^2 + qx + r = 0$ then h is equal to

A. -1

B. 1

C. 2

D. 3

Answer: D

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68. Each of the roots of the equation $x^3 - 6x^2 + 6x - 5 = 0$ are the increased by h so that the new transformed equation does not contain x^2 term, then 'h' is equal to

A. 1

B. 2

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

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

Answer:

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69. The roots of the equation $x^3 - 14x^2 + 56x - 64 = 0$ are in

A. A.G.P

B. H.P

C. A.P

D. G.P

Answer: D

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70. If 1 is multiple root of order 3 for the equation $x^4 - 2x^3 + 2x - 1 = 0$, then the other root is

A. 0

B. -1

C. 1

D. 2

Answer: B

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71. The biquadratic equation, two of whose roots are $1+i, 1-\sqrt{2}$ is

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

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

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

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

Answer: A

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