MATHS

JEE (MAIN AND ADVANCED) MATHEMATICS

QUADRATIC EQUATIONS & EXPRESSIONS

Examples

1. Find the roots of the following equations.

$x^2 - 7x + 12 = 0$

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2. Find the roots of the following equations.

$2x^2 + 3x + 2 = 0$

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3. The roots of the equation $6\sqrt{5}x^2 - 9x - 3\sqrt{5} = 0$ is

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4. Find the roots of $x^2 - 32x - 900 = 0$.

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5. Find the roots of $3x^2 - 5x - 12 = 0$.

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6. Find the sum and product of roots of $x^2 + 7x + 12 = 0$

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7. Form quadratic equation whose roots are :

2,5

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8. Find the quadratic equation whose roots are $3+\sqrt{2}, 3-\sqrt{2}$.

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9. Find the quadratic equation whose roots are 2+3i, 2-3i.

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10. Find the quadratic equation whose roots are $\frac{3 \pm I\sqrt{5}}{2}$.

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11. Let α and β be the roots of the quadratic equation $ax^2 + bx + c = 0, c \neq 0,$ then form the quadratic equation whose roots are $\frac{1-\alpha}{\alpha}$ and $\frac{1-\beta}{\beta}$.

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12. If α, β are the roots of $ax^2 + bx + c = 0$ and $c \neq 0$ find the value of $\frac{1}{(a\alpha + b)^2} + \frac{1}{(a\beta + b)^2}$ interms of a, b, c.

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13. Find the condition that one root of the quadratic equation $ax^2 + bx + c = 0$ shall be n times the other, where n is positive integer.

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14. Find the nature of the roots of the following equation, without finding the roots.

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

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15. Find the nature of the roots of the following equation, without finding the roots.

$9x^2 - 30x + 25 = 0$

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16. Find the nature of the roots of $x^2 - x + 1 = 0$

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17. Find the nature of the roots of $2x^2 + x + 3 = 0$

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18. Find the valve of 'a' for which the following equations have equal roots.

i) $x^2 + (a+3)x + a + 6 = 0$

ii) $2(a+1)x^2 + 2(a+3)x + a + 5 = 0$

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19. The roots of $(x-a)(x-b) = b^2$ are...

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20. Find the equation whose roots are reciprocals of the roots of $5x^2 + 6x + 7 = 0$.

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21. Find the equation whose roots are equal but opposite in sign to the roots of $2x^2 + 3x + 4 = 0$.

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22. Find the equation whose roots are 3 times the roots of the equation $x^2 - 5x + 6 = 0$

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23. Find the equation whose roots are $\frac{1}{4}$ times of the roots of the equation $x^2 - 3x + 2 = 0$

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24. Find the equation whose roots are greater by 2 of the roots of $x^2 - 7x + 12 = 0$

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Solved Examples

1. If $x^2 + bx + c = 0, x^2 + cx + b = 0 (b \neq c)$ have a common root, then show that $b + c + 1 = 0$

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2. If $x^2 - 6x + 5 = 0$ and $x^2 - 3ax + 35 = 0$ have common root, then find a.

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3. Find the value of k if the equation $(k + 1)x^2 + 2(k + 3)x + (k + 8) = 0$ as have equal roots.

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4. Solve $\sqrt{2x+1}+\sqrt{3x+2}=\sqrt{5x+3}$

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5. Solve $3^{1+x}+3^{1-x}=10.$

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6. Solve $4^{x-1}-3.2^{x-1}+2=0$

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7. Solve (x-1)(x-3)(x-5)(x-7)=9.

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8. Solve $\sqrt{\frac{x}{x-3}}+\sqrt{\frac{x-3}{x}}=\frac{5}{2}\,(x\neq 0, x\neq 3)$

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9. The solution set of $\left(x+\frac{1}{x}\right)^2-\frac{3}{2}\left(x-\frac{1}{x}\right)=4$ when $x \neq 0$ is

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10. Some points on a plane are marked and they are connected pair wise by line segments . IF the total number of line segments formed is 10 then the number of marked points on the plane is

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11. Form a quadratic equation whose roots are $2\sqrt{3}-5$ and $-2\sqrt{3}-5$.

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12. One fourth of a herd of goats was seen in the forest. Twice the square root of the number in the herd had gone up the hill and the remaining 15 goats were on the bank of the river. Find the total number of goats.

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Example

1. Determine the sign of the expression

i) $x^2 + x + 1$ ii) $-x^2 + x - 1$ for $x \in R$.

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2. For what values of $x \in R$, the following expressions are positive

i) $x^2 - 5x + 6$ ii) $x^2 - 5x + 14$ iii) $4x - 5x^2 + 1$

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3. For what value of $x \in R$ the following expressions are negative

i) $x^2 - 5x - 6$ ii) $-7x^2 + 8x - 9$

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4. Find the maximum or minimum values of the following expressions on R

i) $2x + 5 - 3x^2$ ii) $12x - x^2 - 32$

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5. Determine the range of the $\frac{x^2 + x + 1}{x^2 - x + 1}$ expressions.

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6. Find the rang of $\frac{2x^2 - 6x + 5}{x^2 - 3x + 2}$.

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7. Find the range of $\frac{(x-1)(x+2)}{x+3}$.

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8. Solve $x^2 - 10x + 21 < 0$ by algebric method and graphical method.

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9. Solve $4 - x^2 < 0$ by algebric method and graphical method.

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10. Solve $x^2 - 4x - 21 \geq 0$ by algebric method and graphical method.

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11. Solve $x^2 - 7x + 6 > 0$.

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12. Solve $\sqrt{(x-3)(2-x)} < \sqrt{4x^2 + 12x + 11}$.

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13. Solve $\frac{(x+1)(x-3)}{(x-2)} \geq 0$.

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14. IF the inequation $\sqrt{3x - 8} < -2$ then

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Additional Solved Exapmles

1. One fourth of a herd of goats was seen in the forest. Twice the square root of the number in the herd had gone up the hill and the remaining 15 goats were on the bank of the river. Find the total number of goats.

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2. Solve the following inequations.

$\sqrt{-x^2+6x-5} > 8-2x$

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Exercise 1 1 Very Short Answer Questions

1. Find the roots of the following quadratic equations

i) $6\sqrt{5}x^2 - 9x - 3\sqrt{5} = 0$

ii) $x^2 - x - 12 = 0$

iii) $2x^2 - 6x + 7 = 0$

iv) $4x^2 - 4x + 17 = 3x^2 - 10x - 17$

v) $x^2 + 6x + 34 = 0$

vi) $3x^2 + 2x - 5 = 0$

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2. Form the quadratic equations whose roots are given below

i) $7 \pm 2\sqrt{5}$

ii) $\frac{a}{b}, \frac{-b}{a} (a \neq 0, b \neq 0)$

iii) $\frac{p-q}{p+q}, -\left(\frac{p+q}{p-q}\right) (p \neq \pm q)$

iv) $-3 \pm 5i$

v) 2, 5 vi) $2 + \sqrt{3}, 2 - \sqrt{3}$

vii) -a+ib, -a-b

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3. Form the values of the following in terms of a, b, c if α, β are roots of

$ax^2 + bx + c = 0, c \neq 0$

i) $\frac{1}{\alpha} + \frac{1}{\beta}$

ii) $\frac{1}{\alpha^2}+\frac{1}{\beta^2}$

iii) $\alpha^3+\beta^3$

iv) $\left(\frac{\alpha}{\beta}-\frac{\beta}{\alpha}\right)^2$

v) $\alpha^4\beta^7+\alpha^7\beta^4$ vi) $\alpha^2+\beta^2$

vii) $\frac{\alpha^2+\beta^2}{\alpha^{-2}+\beta^{-2}}$

viii) $\frac{\alpha}{\beta^2}+\frac{\beta}{\alpha^2}$

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4. Discuss the nature of the following quadratic equations without finding the roots

i) $x^2-12x+32=0$

ii) $2x^2-7x+10=0$

iii) $4x^2-20x+25=0$

iv) $3x^2+7x+2=0$

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Exercise 1 1 Short Answer Questions

1. If $\alpha,$ and β are the roots of $x^2 + px + q = 0$ form a quadratic equation whose roots are $(\alpha - \beta)^2$ and $(\alpha + \beta)^2$.

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2. If α, β are the roots of the quadratic equation $ax^2 + bx + c = 0,$ form a quadratic equation whose roots are $\alpha^2 + \beta^2$ and $\alpha^{-2} + \beta^{-2}$.

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3. If α, β are the roots of the quadratic equation $ax^2 + bx + c = 0$ then form the quadratic equation whose roots are $p\alpha, p\beta$ where p is a real number.

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4. Find a quadratic equation for which the sum of the roots is 7 and the sum of the squares of the roots is 25.

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5. i) Find the two consecutive positive even integers, the sum of whose square is 340.

ii) Prove that there is a unique pair of consecutive odd positive integers such that sum of their squares is 290 find them.

iii) Find all the numbers which exceeds their square root by 12.

iv) Find the quadratic equation for which sum of the roots is 1 and sum of the squares of the roots is 13.

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6. In a cricket match Anil took one wicket less than twice the number of wickets taken by Ravi. If the product of the number of wickets taken by them is 15, find the number of wickets taken by each of them.

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7. Find the value of k if the following equations have equal roots

i) $x^2-2(1+3k)x+7(3+2k)=0$

ii) $x^2-15-k(2x-8)=0$

iii) $(3k+1)x^2+2(k+1)x+k=0$

iv) $x^2+2(k+2)x+9k=0$

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8. If $c^2 \neq ab$ and the roots of $(c^2-ab)x^2-2(a^2-bc)x+(b^2-ac)+0$ are equal show that $a^3+b^3+c^3=3abc$ (or) a = 0.

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9. IF the equation $ax^2+2bx+3c=0$ and $3x^2+8x+15=0$ have a common root , where a,b,c are the length of the sides of a ΔABC , then

$\sin^2 A + \sin^2 B + \sin^2 C =$

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10. Solve the following equations :

i) $x^4 - 5x^2 + 6 = 0$

ii) $x^{2/3} + x^{1/3} - 2 = 0$

iii) $7^{1-x} + 7^{1+x} = 50$

iv) $\sqrt{\left(3x\frac{0}{x+1}\right) + \sqrt{\frac{x+1}{3x}}} = 2$, when $x \neq 0$, -5

v) $\sqrt{\frac{x}{1-x}} + \sqrt{\frac{1-x}{x}} = \frac{13}{6}, x \neq 0, x \neq 1$

vi) $2\left(x + \frac{1}{x}\right)^2 - 7\left(x + \frac{1}{x}\right) + 5 = 0, x \neq 0$

vii) $\left(x^2 + \frac{1}{x^2}\right) - 5\left(x + \frac{1}{x}\right) + 6 = 0, x \neq 0$

viii) $(x+1)(x+2)(x+3)(x+4) = 120$

ix) $2x^4 + x^3 - 11x^2 + x + 2 = 0$

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11. The cost of a piece of cable wire is Rs.35/-. If the length of the piece of wire is 4 meters more each meter costs Rs. 1/- less, the cost would remain unchanged. What is the length of the wire ?

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Exercise 1 2 Very Short Answer Questions

1. For what value of x, the following expressions are positive ?

$3x^2 + 4x + 4$

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2. For what values of $x \in R$, the following expressions are negative

i) $-6x^2 + 2x - 3$ ii) $15 + 4x - 3x^2$ iii) $2x^2 + 5x - 3$ iv) $x^2 - 7x + 10$ v) $x^2 - 5x - 6$

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3. Discuss the sign of the following expressions when x is real

i) $x^2 - 5x + 6$ ii) $x^2 - x + 3$

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4. Find the changes of sign of the following expressions and find extreme values

i) $15 + 4x - 3x^2$ ii) $4x - 5x^2 + 2$

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5. Find the maximum or minimum values of the following expressions

i) $2x - 7 - 5x^2$ ii) $3x^2 + 2x + 11$ iii) $ax^2 + bx + a, a, b \in R, a \neq 0$ iv) $x^2 - x + 7$

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6. At what values of $x \in R$ the following quadratic expressions have maximum or minimum values

i) $x^2 + 5x + 6$ ii) $2x - x^2 + 7$

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Exercise 1 2 Short Answer Questions

1. Find the greatest and least values of

$$\frac{x+2}{2x^2+3x+6} \forall x \in R$$

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2. If x is real, prove that $\frac{x}{x^2-5x+9}$ lies between 1 and $\frac{-1}{11}$.

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3. If $\frac{x-p}{x^2-3x+2}$ takes all real values for $x \in R$ then the range of P is

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4. Show that none of the values of the function $\frac{x^2+34x-71}{x^2+2x-7}$ over R lies between 5 and 9.

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

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6. Find the solutions set of

i) $x^2+x-12 \leq 0$ ii) $x^2-2x+1<0$ iii) $2-3x-2x^2 \geq 0$ over R by both algebric and graphical methods.

iv) $15x^2+4x-4 \leq 0$

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

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8. Solve the inequation $\frac{\sqrt{6 + x - x^2}}{2x + 5} \geq \frac{\sqrt{6 + x - x^2}}{x + 4}$.

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9. Solve the equation $\sqrt{-x^{92}} + 6x - 5 > 8 - 2x$.

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10. Solve the inequation $\sqrt{x + 2} > \sqrt{8 - x^2}$.

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11. Solve the inequation $\sqrt{x^2 - 3x - 10} > (8 - x)$.

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Additional Exercise

1. Find the maximum or minimum values of the following expressions on R

i) $x^2 + 6x - 27$ ii) $3x^2 + 2x + 7$ iii) $x^2 - 12x + 32$ iv) $2x^2 + 3x + 1$

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2. Solve the follwing inequations by algebric and graphical methods.

i) $x^2 - 8x + 15 > 0$ ii) $2x^2 + 3x - 2 < 0$ iii) $x^2 - 4x + 5 > 0$ iv) $15x^2 + 4x - 5 \leq 0$

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3. The cost of a piece of cable wire is Rs. 35/-, If the length of the piece of wire is 4 meters more and each meter costs, Rs. 1/- less, the cost would remain un-changed. What is the length of the wire ?

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4. $\sqrt{\frac{3x}{x+1}} + \sqrt{\frac{x+1}{3x}} = 2, \quad \text{when} \quad x \neq 0 \text{ and } x \neq -1$

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5. Solve $\sqrt{3x+1} - \sqrt{x-1} = 2.$

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6. Solve the following in equations :

i) $\sqrt{x+2} > \sqrt{8-x^2}$

ii) $\sqrt{(x-3)(2-x)} < \sqrt{4x^2+12x+11}$

iii) $\sqrt{x^2-3x-10} > 8-x$

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7. Solve the following equations :

i) $9\left(x^2+\frac{1}{x^2}\right)-27\left(x+\frac{1}{x}\right)+8=0$

ii) $9\sqrt{\frac{x}{x+3}}-\sqrt{\frac{x+3}{x}}=2$

iii) $\sqrt{\frac{4x-1}{4x+1}}-\sqrt{\frac{4x+1}{4x-1}}=\frac{8}{3}$

iv) $\sqrt{3x^2+1}+\frac{4}{\sqrt{3x^2+1}}=5$

v) $2\left(x^2+\frac{1}{x^2}\right)-3\left(x+\frac{1}{x}\right)=1$

vi) x(x+2)(x+3)(x+5)=72

vii) x(x-1)(x+2)(x-3)= -8

viii) (x-1)(x+1)(2x+3)(2x-1)=3

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

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9. If a, b, c are in G.P then prove that equations $ax^2 + 2bx + c = 0$ and $dx^2 + 2ex + f = 0$ have a common root if $\frac{d}{a}, \frac{e}{b}, \frac{f}{c}$ are in A.P.

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10. IF α, β are the roots of $ax^2 + bx + c = 0$ then $(a\alpha + b)^{-2} + (a\beta + b)^{-2}$=

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Exercise I

1. IF m,n,K are rational and $m = k + \frac{n}{k}$ then the roots of $x^2 + mx + n = 0$ are

A. k, $\frac{n}{k}$

B. k, $\frac{-n}{k}$

C. -k, $\frac{-n}{k}$

D. -k, $\frac{n}{k}$

Answer: C

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2. 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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3. Assertion (A): The roots of the equation $a(b-c)x^2 + b(c-a)x + c(a-b) = 0$ are 1, $\frac{c(a-b)}{a(b-c)}$

Reason (R): If a+b+c=0 then the roots of $ax^2 + bx + c = 0$ are 1, $\frac{c}{a}$

A. Both A, R are true and R explain Assertion

B. Both A, R are true but R does't explain A

C. A is true R is false

D. A is false R is true

Answer: A

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4. If α, β are the roots of $x^2 - p(x+1) + c = 0$ then $(1+\alpha)(1+\beta) =$

A. 1+ c

B. 1-c

C. p + c

D. p-c

Answer: A

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5. If α, β are the roots of $x^2 + x + 1 = 0$ then $\alpha/\beta + \beta/\alpha =$

A. -1

B. 1

C. 2

D. i

Answer: A

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6. If α, β are the roots of $x^2 - x + 3 = 0$, then $\alpha^4 + \beta^4$ =

A. 10

B. 7

C. -10

D. 8

Answer: B

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7. The values 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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8. If α, β are the roots of $x^2 + ax - b = 0$ and γ, σ are the roots of $x^2 + ax + b = 0$ then $(\alpha - \gamma)(\beta - \gamma)(\alpha - \sigma)(\beta - \sigma) =$

A. $4b^2$

B. b^2

C. $2b^2$

D. $3b^2$

Answer: A

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

A. 0

B. 1

C. 2

D. 3

Answer: B

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10. If $p \neq 0, q \neq 0$ and the roots of $x^2 + px + q = 0$ are p and q, then (p, q) =

A. (1, -2)

B. (1, 1)

C. (2, -2)

D. (-1, 2)

Answer: A

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11. IF the sum of the square of the roots of $x^2 + px - 3 = 0$ is 10 then the values of p=

A. ± 2

B. ± 3

C. 5

D. -5

Answer: A

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

A. 1, -1

B. -9, 2

C. -8, -2

D. 9, 1

Answer: D

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13. IF $k > 0$ and the product of the roots of the equation $x^2 - 3kx + 2e^2 \log k$-1=0 is 7 then the sum of the roots is

A. 12

B. 4

C. 3

D. -12

Answer: A

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14. If x+1 is a factor of $x^4 + (p-3)x^3 - (3p-5)x^2 + (2p-9)x + 6$, then the value of p is

A. -4

B. 0

C. 4

D. 2

Answer: C

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15. If $\sin\theta, \cos\theta$ are the roots of $6x^2 - px + 1 = 0$, then p^2 =

A. 40

B. 48

C. 36

D. 24

Answer: B

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16. Which of the following statements are correct

E_1) If a + b + c = 0 then 1 is a root of $ax^2 + bx + c = 0$.

E_2) If $\sin\alpha, \cos\alpha$ are the roots of the equation $ax^2 + bx + c = 0$ then $b^2 - a^2 = 2ac$

A. only E_1

B. only E_2

C. both E_1 and E_2

D. neither E_2 nor E_2

Answer: C

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17. IF α, β are the roots of the equation $ax^2 + bx + c = 0$then the quadratic equation whose roots are $\alpha + \beta, \alpha\beta$ is

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

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

C. $a^2x^2 + (b + c)x + bc = 0$

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

Answer: B

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18. If α, β are the roots of $x^2 - x + 1 = 0$ then the quadratic equation whose roots are $\alpha^{2015}, \beta^{2015}$ is

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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19. the equation formed by decreasing each root of $ax^2 + bx + C = 0$ by 1 is $2x^2 + 8x + 2 = 0$ then

A. a+b=0

B. b+c=0

C. b=c

D. a=b

Answer: B

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

A. $x^2 - 6x + 1 = 0$

B. $x^2 + 6x - 1 = 0$

C. $x^2 + 6x + 1 = 0$

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

Answer: A

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21. If α, β are the roots of $x^2 + 6x + 9 = 0$, then the equation whose roots are $\frac{1}{\alpha}, \frac{1}{\beta}$ is

A. $2x^2 + 3x - 18 = 0$

B. $x^2 + 6x - 9 = 0$

C. $9x^2 + 6x + 1 = 0$

D. $9x^2 - 6x + 1 = 0$

Answer: C

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22. The equation whose roots are 'K' times the roots of the equation $ax^2 + bx + c = 0$ is

A. $ax^2 + Kbx + Kc = 0$

B. $ax^2 + K^2by + K^2c = 0$

C. $ax^2 + Kbx + K^2c = 0$

D. $ax^2 + K^2bx + Kc = 0$

Answer: C

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23. If α, β be the roots of the equation $ax^2 + bx + c = 0$, then the roots of the equation $ax^2 + b\lambda x + c\lambda^2 = 0, \lambda^2 \neq 0$, are

A. $\lambda\alpha, \lambda\beta$

B. $\frac{\alpha}{\lambda}, \frac{\beta}{\lambda}$

C. α, β

D. α^k, β^k

Answer: A

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24. If α, β are the roots of $x^2 + 2x + 5 = 0$, then the equation whose roots are $\frac{\alpha + 1}{\alpha}, \frac{\beta + 1}{\beta}$ is

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

B. $5x^2 - 8x + 4 = 0$

C. $5x^2 - 10x + 4 = 0$

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

Answer: B

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25. If r is the ratio of the roots of $ax^2 + bx + C = 0$ then $\frac{(r+1)^2}{r}$=

A. $\frac{b}{ac}$

B. $\frac{2b}{a}$

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

D. $\frac{2b}{c}$

Answer: C

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26. If one root of $x^2 + kx + 27 = 0$ may be triple the other, then k=

A. ± 6

B. ± 8

C. ± 12

D. ± 10

Answer: C

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27. If one root of $x^2 + px + 1 = 0$ is square that of the other thenp=

A. 1, -2

B. 3, -1

C. 2, -5

D. 2, 3

Answer: A

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28. If one root of $x^2 + px + q = 0$ may be the square pf the other, then $p^3 + q^2 + q =$

A. 4pq

B. 3pq

C. 2pq

D. pq

Answer: B

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29. The quadratic equation with rational coefficients whose one root is $3+\sqrt{2}$ is

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

B. $x^2-6x-7=0$

C. $x^2-6x+7=0$

D. $x^2+6x-7=0$

Answer: C

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30. If 3+4i is a root of equation $x^2+px+q=0$ where $p, q \in R$ then

A. p=6, q=25

B. p=6, q=-25

C. p= -6, q= -7

D. p= -6, q=25

Answer: D

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31. The quadratic equation whose one root is $\frac{-3+I\sqrt{7}}{4}$ is

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

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

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

D. $2x^2 + 3x + 2 = 0$

Answer: D

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32. If the roots of $x^2 - 2(7+3m)x + 55m + 45 = 0$, are equal, then m =

A. 1, $\frac{4}{9}$

B. -1, $\frac{-4}{9}$

C. 1, $\frac{-4}{9}$

D. -1, $\frac{+4}{9}$

Answer: A

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

A. rational and equal

B. rational and not equal

C. irrational

D. imaginary

Answer: C

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34. IF the roots of the equation $x^2 + a^2 = 8x + 6a$ are real , then a lies between

A. [2, 9]

B. [-2, 8]

C. [0, 7]

D. [6, 8]

Answer: B

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35. If the roots of $\frac{x^2 - bx}{ax - c} = \frac{k - 1}{k + 1}$ are numerically equal but opposite in sign, then k =

A. c

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

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

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

Answer: D

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36. 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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37. The value of 'a' for which the equation $3x^2 + 2(a^2 + 1)x + (a^2 - 3a + 2) = 0$ has roots of opposite sign, lies in

A. (1, 2)

B. $(-\infty, 1)$

C. $(2, \infty)$

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

Answer: A

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38. If the roots $ax^2 + bx + c = 0$ are both negative and $b < 0$, then

A. $a < 0, c < 0$

B. $a < 0, c > 0$

C. $a > 0, c < 0$

D. $a > 0, c > 0$

Answer: A

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39. The coefficient of x in a quadratic equation $x^2 + px + q = 0$ was taken as 17 in place of 13 and its roots found to be -2 and -15. The roots of the original equation are

A. 2,15

B. 10, 3

C. -10, -3

D. -2, -15

Answer: C

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40. In finding the roots of $x^2 + px + q = 0$ the coefficient of x was taken as -7 instead of -8 and the roots were 4 and 3 then the correct roots are

A. 4, 3

B. 2, 4

C. 2, 6

D. 4, 6

Answer: C

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41. IF the harmonic mean between the roots of $\left(5 + \sqrt{2}\right)x^2 - bx + \left(8 + 2\sqrt{5}\right) = 0$ 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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42. The equation $x - \frac{2}{x-1} = 1 - \frac{2}{x-1}$ has

A. No root

B. One root

C. Two roots

D. infinite roots

Answer: A

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43. If a = 0 then the equation $\frac{x-a-1}{x-a}=(a+1)-\frac{1}{x-a}$ has

A. One root

B. Two roots

C. Many roots

D. No root

Answer: C

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44. If $x^2+ax+b=0, x^2+bx+a=0$ $(a \neq 0)$ have a common root, then a + b =

A. 3

B. 2

C. 1

D. -1

Answer: D

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45. The value of a such that $x^2 - 11x + a = 0, x^2 - 14x + 2a = 0$ may have a common root is

A. 1

B. 12

C. 24

D. 32

Answer: C

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46. if $2x - 7 - 5x^2$ has maximum value at $x = a$ then a=

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

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

C. $\frac{34}{5}$

D. $-\frac{34}{5}$

Answer: B

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47. The greatest value of $\frac{4}{4x^2+4x+9}$ is

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

B. 4

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

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

Answer: D

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48. The smallest value of $x^2 - 3x + 3$ in the interval $\left[-3, \frac{3}{2}\right]$ is

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

B. 5

C. -15

D. -20

Answer: A

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49. I) The maximum value of $c + 2bx - x^2$ is $c + b^2$

II) The minimum value of $x^2 + 2bx + c$ is $c - b^2$

Which of the above statements is true ?

A. only I

B. only II

C. both I and II

D. neither I nor II

Answer: C

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

A. $ac > 0$

B. $ak^2 + bk + c > 0$

C. $ac < 0$

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

Answer: D

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51. The least integral value of x for which $33 - x(2 + 3x) > 0$ is

A. 1

B. 2

C. -4

D. -3

Answer: D

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52. The set of values of x for which the inequalities $x^2 - 2x + 3 > 0, 2x^2 + 4x + 3 > 0$ hold simultancously , is

A. (1, 2)

B. (2, 5)

C. $(0, \infty)$

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

Answer: D

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

A. (-2, 5)

B. (2, 8)

C. (-2, 8)

D. (2, 5)

Answer: D

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55. If the graph of $y = ax^2 + bx + c$ lies completely above the x-axis, then

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

B. $b^2 - 4ac > 0, a < 0$

C. $b^2 - 4ac < 0, a > 0$

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

Answer: C

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56. The set of values of $x \in R$ satisfying the inequality $x^2 - 4x - 21 \leq 0$ is

A. (3, 7]

B. (-3, 7]

C. [-7, 3]

D. [-7, -3]

Answer: B

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Exercise Ii

1. IF α, β are real and $\alpha^2, -\beta^2$ are the roots of $a^2x^2 + x + 1 - a^2 = 0(A > 1)$ then β^2 =

A. a^2

B. 1

C. $1 - a^2$

D. $1 + a^2$

Answer: B

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

A. b+q

B. b-q

C. 2(b+q)

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

Answer: D

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

A. 1

B. 2

C. 3

D. 0

Answer: C

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

A. 0,1

B. -1, 2

C. 0, -1

D. -1, 1

Answer: C

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5. If α, β are the roots of $x^2 + 7x + 3 = 0$ then $(\alpha - 1)^2 + (\beta - 1)^2$=

A. 59

B. 69

C. 39

D. 49

Answer: A

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6. If α, β are the roots of $ax^2 + bx + c = 0$ then $\left(1 + \alpha + \alpha^2\right)\left(1 + \beta + \beta^2\right)$ is

A. $\frac{1}{a^2}\left(a^2 + b^2 + c^2 + ab + bc + ca\right)$

B. $\frac{1}{a^2}\left(a^2 + b^2 + c^2 - ab - bc - ca\right)$

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

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

Answer: B

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7. IF $\alpha, , \beta$ are the roots of the equation $8x^2 - 3x + 27 = 0$ then the value of $\left(\frac{\alpha^2}{\beta}\right)^{1/3} + \left(\frac{\beta^2}{\alpha}\right)^{1/3}$ is

A. $\frac{1}{6}$

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

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

D. 4

Answer: A

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8. Assertion (A): If n is a multiple of 6 and α, β are the roots of $x^2 + x + 1 = 0$ then $(1+\alpha)^{-n} + (1+\beta)^{-n} = 2$

Reason (R) : The roots of $x^2 + x + 1 = 0$ are ω, ω^2 and ω^n, $\omega^{2n} = 2$ when $n = 3k, k \in z$

A. Both A, R are true and R explain Assertion

B. Both A, R are true but R does't explain A

C. A is true R is false

D. A is false R is true

Answer: A

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9. If α, β are the roots of $x^2 + px + 1 = 0$ and γ, δ are the roots of $x^2 + qx + 1 = 0$ then $(\alpha - \gamma)(\beta - \gamma)(\alpha + \delta)(\beta + \delta) =$

A. $q^2 - p^2$

B. $p^2 - q^2$

C. $p^2 + q^2$

D. $p^2 q^2$

Answer: A

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10. If α, β are the roots of $3x^2 + 5x - 7 = 0$ then $\frac{1}{(3\alpha + 5)^2} + \frac{1}{(3\beta + 5)^2} =$

A. $-\frac{17}{21}$

B. $\frac{67}{21}$

C. $\frac{67}{441}$

D. $\frac{76}{441}$

Answer: C

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11. Assertion (A) : If α, β are the roots of $ax^2 + bx + c = 0$ then $\left(\frac{\alpha}{\alpha\beta + b}\right)^3 - \left(\frac{\beta}{a\alpha + b}\right)^3 = 0$

Reason (R) : If a,B are the roots of $ax^2 + bx + c = 0$ then $\frac{\alpha}{\alpha\beta + b} = \frac{\beta}{a\alpha + b}$

A. Both A, R are true and R explain Assertion

B. Both A, R are true but R does't explain

C. A is true R is false

D. A is false R is true

Answer: A

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12. If the difference between the roots of $x^2 + ax + 1 = 0$ is Jess than $\sqrt{5}$ then the set of possible values of a is

A. $(3, \infty)$

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

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

D. $(-3, \infty)$

Answer: C

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13. The value of c for which $\left|\alpha^2 - \beta^2\right| = \frac{7}{4}$ where a and B are the roots of $2x^2 + 7x + c = 0$ is

A. 4

B. 0

C. 6

D. s

Answer: C

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14. If the sum of the roots of the equation $x^2 + px + q = 0$ is 3 times their difference, then

A. $p^2 = 6q$

B. $2p^2 = 9q$

C. $4p^2 = 14q$

D. $p^2 + q^2 = 4$

Answer: B

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15. If the difference between the roots of $x^2 + ax + b = 0$ is equal to the difference between the roots of $x^2 + px + q = 0$ then $a^2 - p^2$=

A. b-q

B. 2(p-q)

C. 4(b-q)

D. 8(b+q)

Answer: C

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16. In a triangle PQR, $\angle R = \frac{\pi}{2}$ If $\tan\left(\frac{P}{2}\right)$ and $\tan\left(\frac{Q}{2}\right)$ are the roots of $ax^2 + bx + c = 0, a \neq 0$ then

A. a = b + c

B. c = a + b

C. b = c

D. b = a + c

Answer: B

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17. If $\tan^2\theta, \sin^2\theta$ are the roots of $ax^2 + bx + c = 0$ then $b^2 - c^2 =$

A. 4ac

B. a^2

C. $4bc$

D. 4ab

Answer: A

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18. If the roots of $ax^2 + bx + c = 0$ are 2, $\frac{3}{2}$ then $(a + b + c)^2$

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

B. $\frac{a^2}{4}$

C. $\frac{a^2}{8}$

D. $\frac{a^2}{16}$

Answer: B

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19. If α, β are the roots of $x^2 + x + 3 = 0$ then $5\alpha + \alpha^4 + \alpha^3 + 3\alpha^2 + 5\beta + 3 =$

A. 0

B. -1

C. -2

D. -3

Answer: C

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20. IF $x^2 - 3x + 2$ is a factor of $x^4 - px^2 + q = 0$ then $(p, q) = 0$

A. (-4, -5)

B. (4, 5)

C. (-5, 4)

D. (5, 4)

Answer: D

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

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

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

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

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

Answer: C

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22. If the arithmetic mean of the roots of quadratic equation is $\frac{8}{5}$ and the arithmetic mean of their reciprocals is $\frac{5}{8}$ then the equation is

A. $5x^2 + 16x + 7 = 0$

B. $5x^2 - 16x + 7 = 0$

C. $x^2 - 6x + 7 = 0$

D. $5x^2 + 7x + 16 = 0$

Answer: B

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23. The equation whose roots are the arthmatic mean and twice the H.M between the roots of the equation $x^2 + ax - b = 0$ is

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

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

C. $2ax^2 + (a^2 - 8b)x - 4ab = 0$

D. $2ax^2 - 8bx - 4ab = 0$

Answer: C

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24. If α, β are the roots of the equation $x^2 + 7x + 12 = 0$, then the equation whose roots are $(\alpha + \beta)^2$ and $(\alpha - \beta)^2$ is

A. $x^2 + 50x + 49 = 0$

B. $x^2 - 50x + 49 = 0$

C. $x^2 - 50x - 49 = 0$

D. $x^2 + 12x + 7 = 0$

Answer: B

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25. If $a\left(5 + q^2\right) + 2bq + c = 0$ and $a\left(5 + r^2\right) + 2br + c = 0$ where $a \neq 0$ then q + r =

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

B. $\frac{2b}{a}$

C. $\frac{a}{2b}$

D. $\frac{-a}{2b}$

Answer: A

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26. If α, β are the roots of $x^2 - 2x + 4 = 0$ and for any $n \in N, a^n + B^n = k \cos \frac{n\pi}{3}$ then k=

A. 2^n

B. 2^{n+1}

C. $2^n - 1$

D. $2^n + 1$

Answer: B

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27. If A, B, C, D are the sum of the square of the roots of $2x^2 + x - 3 = 0, x^2 - x + 2 = 0, 3x^2 - 2x + 1 = 0, x^2 - x + 1 = 0$ then the ascending order of A, B, C, D is

A. $B < D < C < A$

B. $B < C < A < D$

C. $C < B < A < D$

D. $A < D < C < B$

Answer: A

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28. The equation formed by decreasing each root of $ax^2 + bx + c = 0$ by 1 is $2x^2 + 13x + 2 = 0$ then

A. a= -b

B. b= -c

C. c= -a

D. b= a+c

Answer: B

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29. α, β are the real roots of $ax^2 + bx + c = 0$ observe the following lists

List - I	List - II
A) a, b, c have same sign	1) $\alpha,\beta = 1$
B) If $a = c$	2) -1
C) If $a + b + c = 0$ then one root is	3) α and β are negative
D) If $a+c=b$ then one root is	4) 0
	5) 1

then the correct matching is

A.
A	B	C	D
1	1	2	5

B.
A	B	C	D
1	3	4	5

C.
A	B	C	D
3	1	5	4

D.
A	B	C	D
3	1	5	2

Answer: D

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30. If $x^2 + px + q = 0$ is the quadratic equation whose roots are a-2 and b-2 where a and b are the roots of $x^2 - 3x + 1 = 0$ then

A. p = 1, q = 5

B. p = 1, q = -5

C. p = 1, q = 2

D. p = 1, q = -1

Answer: D

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

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

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

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

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

Answer: D

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32. If ω is an imaginary cube root of unity then the equation whose roots are $2\omega + 3\omega^2$ and $2\omega^2 + 3\omega$ is

A. $x^2 + 5x + 7 = 0$

B. $x^2 + 5x - 7 = 0$

C. $x^2 - 5x + 7 = 0$

D. $x^2 - 5x - 7 = 0$

Answer: A

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33. The equation whose roots are half of roots of the equation $2x^2 + 5x + 4 = 0$ is

A. $8x^2 + 10x + 1 = 0$

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

C. $8x^2 + 5x + 1 = 0$

D. $16x^2 + 5x + 1 = 0$

Answer: B

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34. Assertion (A) : If α, β are the roots of $ax^2 + bx + c = 0$ then the equation whose roots are $\frac{\alpha - 1}{\alpha}, \frac{\beta - 1}{\beta}$ is $c(1-x)^2 + b(1-x) + a = 0$

Reason (R): If α, β are the roots of f(x) = 0 then the equation whose roots are $\frac{\alpha - 1}{\alpha}$ and $\frac{\beta - 1}{\beta}$ is $f\left(\frac{1}{1-x}\right) = 0$

A. Both A, R are true and R explain Assertion

B. Both A, R are true but R does't explain A

C. A is true R is false

D. A is false R is true

Answer: A

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35. IF α and β are the 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=

A. a + 2b

B. a + b + c

C. ab + bc + ca

D. abc

Answer: B

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36. If α, β are the roots of $ax^2 + bx + c = 0$ then the equation with roots $\frac{1}{a\alpha + b}, \frac{1}{a\beta + b}$ is

A. $acx^2 + bx + 1$

B. $acx^2 + bx - 1 = 0$

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

D. $acx^2 - bx - 1 = 0$

Answer: D

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37. Number of quadratic equations which are unchanged by squaring their roots is p and the sum of roots of all those quadratic equations is q then

A. p = q = 4

B. p = 4, q = 2

C. p = 2, q=4

D. p = q = 2

Answer: B

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38. $3+4i$ is a root of $x^2+Ax+B=0$ and $\sqrt{3}-2$ is a root of $x^2+Cx+D=0$ then

A. $A<C<\ <D<B$

B. $A<D<C<B$

C. $A>C>D>B$

D. $A>D>C>B$

Answer: B

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39. If the ratio of the roots of $x^2 + bx + c = 0$ is equal to the ratio of the roots of $x^2 + px + q = 0$, then $p^2c - b^2q =$

A. 0

B. 1

C. 2

D. 3

Answer: A

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40. If the ratio of the roots of the equation $ax^2 + bx + c = 0$ is m: n then

A. $\frac{m}{n} + \frac{n}{m} = \frac{b^2}{ac}$

B. $\sqrt{\frac{m}{n}}+\sqrt{\frac{n}{m}}=\frac{b}{\sqrt{ac}}$

C. $\sqrt{\frac{m}{n}}+\sqrt{\frac{n}{m}}=\frac{b^2}{ac}$

D. $\frac{m}{n}+\frac{n}{m}=\frac{a^2}{b^2}$

Answer: B

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41. If α, β are the roots of the equation $x^2+Px+P^3=0, P\neq 0$ such that $\alpha=\beta^2$ then the roots of the given equation are

A. 4, -2

B. 4, 2

C. 1, -1

D. 1,1

Answer: A

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42. If one root of $x^2 + px + 1 = 0$ is the cube of the other root then p =

A. 0

B. 1

C. $1, \pm 2$

D. $0, \pm 2$

Answer: D

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43. If 3+4i is a root of the equation $ax^2 + bx + c = 0$ where $a, b, c \in R$ then 31a+b+c=

A. 0

B. 2a

C. 2b

D. 2c

Answer: D

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44. Assertion (A) : If one root of $x^2 - (3 + 2i)x + (1 + 3i) = 0$ is 2+ i then the other root is 2-i

Reason (R) : Imaginary roots (if occur) of a quadratic equation occurs in conjugate pairs only if the coefficients Q.E. are all real.

A. Both A, R are true and R explain Assertion

B. Both A, R are true but R does't explain A

C. A is true R is false

D. A is false R is true.

Answer: D

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45. IF α, β are the roots of the equation $x^2 + 2ax + b = 0$, then the quadratic equation with rational coefficient one of whose roots is $\alpha + \beta + \sqrt{\alpha^2 + \beta^2}$ is

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

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

C. $x^2 - 4ax - 2b = 0$

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

Answer: D

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46. If $x^2 + px + q = 0$ has roots 2i + 3, 2i–3 then the discriminant of the equation is

A. 36

B. 32

C. -36

D. -16

Answer: A

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47. The quadratic equation whose one root is $\frac{3+\sqrt{5}}{2-\sqrt{5}}$ is

A. $x^2 + 22x + 4 = 0$

B. $x^2 + 22x - 4 = 0$

C. $x^2 + 11x + 8 = 0$

D. $x^2 + 11x - 8 = 0$

Answer: B

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

A. $\frac{1}{p}+\frac{1}{r}$

B. $\frac{1}{p}-\frac{1}{r}$

C. $\frac{1}{r}-\frac{1}{p}$

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

Answer: A

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49. Assertion (A): If the roots of $\left(a^2+b^2\right)x^2-2b(a+c)x+\left(b^2+c^2\right)=0$ are real and equal then a, b, c are in G.P.

Reason (R): If the sum of two non-negative reals is zero then each of them is zero.

A. Both A, R are true and R explain Assertion

B. Both A, R are true but R does't explain A

C. A is true R is false

D. A is false R is true

Answer: A

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

A. 3

B. 12

C. $\frac{49}{4}$

D. 16

Answer: C

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51. The roots of $(x-b)(x-c)+(x-a)(x-c)+(x-a)(x-b)=0$ are

A. $a>b>btc$

B. $a=b=c$

C. $a<b<c$

D. a+b+c=0

Answer: B

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52. If the quadratic expression $x^2-(a-1)x+\left(a+\frac{1}{4}\right)$ were to be a perfect square then a=

A. 0, 6

B. 2, 4

C. 1, 8

D. 4, 8

Answer: A

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53. If $0 > a > b > c$ and the roots α, β are imaginary roots of $ax^2 + bx + c = 0$ then

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

B. $|\alpha| > 1$

C. $|\beta| < 1$

D. $\alpha + \beta = 0$

Answer: A

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54. For $a, b, c \in Q$ and $b + c \neq a$, the roots of $ax^2 - (a + b + c)x + (b + c) = 0$

A. Rational and unequal

B. rational and equal

C. complex numbers

D. Canot be determined

Answer: A

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55. For $a, b, c \in R$ and a, b, c are different, then the roots of $(x + a)(x + b) = c^2$ are

A. real and equal

B. real and unequal

C. complex number

D. Cannot be determined

Answer: B

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56. If a, b, c are real then $(b-x)^2 - 4(a-x)(c-x) = 0$ will have always roots which are

A. real and equal

B. real and distinct

C. imaginary

D. both 1 and 2

Answer: D

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

A. real

B. imaginary

C. rational

D. equal

Answer: B

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58. The root of $(x-a)(x-a-1) + (x-a-1)(x-a-2) + (x-a)(x-a-2) = 0,$ are always

A. real and equal

B. imaginary

C. real and unequal

D. rational and equal

Answer: C

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59. 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: D

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60. The roots of $ax^2 + 2bx + c = 0$ and $bx^2 - 2\sqrt{ac}x + b = 0$ are simultaneously real, then

A. a=b, c=0

B. $ac = b^2$

C. $4b^2 = ac$

D. $ab = c^2$

Answer: D

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

A. 10, 8

B. 12, 10

C. 12, 8

D. 12, 6

Answer: C

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62. If the roots of $\frac{1}{x+a}+\frac{1}{x+b}=\frac{1}{c}$ are equal in magnitude and opposite in sign, then the product of roots is

A. a^2+b^2

B. $-\left(a^2+b^2\right)$

C. $\frac{1}{2}\left(a^2+b^2\right)$

D. $-\frac{1}{2}\left(a^2+b^2\right)$

Answer: D

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63. If (x + 2)(x + 3b) = c has roots α, β , then the roots of $(x+\alpha)(x+\beta)+c=0$ are

A. a,b

B. -a, -b

C. -2, -3b

D. 2a, 3b

Answer: D

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64. IF $20^{3-2x^2} = \left(40\sqrt{5}\right)^{3x^2-2}$, then x=

A. $\pm\sqrt{\frac{13}{12}}$

B. $\pm\sqrt{\frac{12}{13}}$

C. $\pm\sqrt{\frac{4}{5}}$

D. $\pm\sqrt{\frac{5}{4}}$

Answer: B

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65. $\{x \in R : |x-2| = x^2\} =$

A. (-1, 2)

B. (1, 2)

C. (-1, -2)

D. {1, -2}

Answer: D

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66. The equation $|2x - x^2 - 3| = 1$ has

A. only real solution

B. no real solution

C. 4 real solutions

D. infinite number of real solutions

Answer: B

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67. If $\left|x^2\right| + |x| + 12 = 0$, then x =

A. 3 or - 4

B. -3 or -4

C. ± 3 or ± 4

D. No solution

Answer: D

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68. The number of real roots of $\left|x^2\right| - 5|x| + 6 = 0$ is

A. 2

B. 3

C. 4

D. 1

Answer: C

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69. $\sqrt{\frac{x}{x-3}} + \sqrt{\frac{x-3}{x}} = \frac{5}{2}, x \neq 0, x \neq 3$ then x=

A. -1

B. $4, \frac{1}{4}$

C. $4, -1$

D. 5, -1

Answer: C

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70. If the sum of the roots of the quadratic equation $ax^2 + bx + c = 0$ is equal to the sum of the squares of their reciprocals, then a/c, b/a and c/b are in

A. A.P

B. G.P

C. H.P

D. A.G.P

Answer: C

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71. The number of solutions of the equation $\left|x^2\right| - 3|x| + 2 = 0$ is

A. 2

B. 4

C. 1

D. 3

Answer: B

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72. The number of real roots of $3^{2x^2 - 7x + 7} = 9$ is

A. 0

B. 2

C. 1

D. 4

Answer: B

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73. The equation $e^{\sin x} - e^{-\sin x} - 4 = 0$ has

A. Infinite number of real roots

B. no real roots

C. exactly one real root

D. exactly four real roots.

Answer: B

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

A. 0

B. 2

C. 4

D. 6

Answer: A

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75. The number of solutions of the system of equations given below is

$|x| + |y| = 1, x^2 + y^2 = a^2, \frac{1}{\sqrt{2}} < a < 1$

A. ∞

B. 2

C. 4

D. 8

Answer: D

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76. The equation $x^2 + x^{-2} = \sin^2 x \,.\frac{\cos^2(x)}{2}, 0 > x < \frac{\pi}{2}$ has

A. no real solution

B. one real solution

C. two real solutions

D. four real solutions

Answer: A

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77. Assertion (A) : The number of real solutions of the equation $\sin x = x^2 + 3x + 4$ is zero

Reason (R): $-1 \geq \sin x \leq 1, \forall x \in R$

A. Both A, R are true and R explain Assertion

B. Both A, R are true but R does't explain A

C. A is true R is false

D. A is false R is true

Answer: A

View Text Solution

78. The number of solutions of the equation $|x| = \cos x$ is

A. one

B. two

C. three

D. zero

Answer: B

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79. If the equations $x^2 + ax + bc = 0$ and $x^2 + bx + ca = 0$ have a common root, then their other roots satisfy the equation

A. $x^2 + (a + b + c)x + ab = 0$

B. $x^2 + cx + ab = 0$

C. $x^2 - cx + ab = 0$

D. $x^2 + (a + b)x + ab = 0$

Answer: B

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

A. 2

B. 3

C. $\sqrt{3}$

D. $\sqrt{2}$

Answer: C

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

A. 1:2:3

B. 3:2:1

C. 1:3:2

D. 3:1:2

Answer: A

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82. If every pair from among the equations $x^2 + ax + bc = 0, x^2 + bx + ca = 0, x^2 + cx + ab = 0$ has a common root, then the sum of the three common roots is

A. abc

B. 2abc

C. 3(a+b+c)

D. (a+b+c)

Answer: D

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83. If $x^2 - cx + d = 0, x^2 - ax + b = 0$ have one common root and second has equal roots then $2(b + d)$ =

A. a+c

B. a-c

C. ac

D. a/c

Answer: C

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84. 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. 1

B. 2

C. -1

D. -2

Answer: B

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85. The harmonic mean of two numbers is $-\frac{8}{5}$ and their geometric mean is 2 . The quadratic equation whose roots are twice those numbers is

A. $x^2 + 10x + 16 = 0$

B. $x^2 - 10x + 16 = 0$

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

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

Answer: A

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86. The number of values of a for which $(a^2-3a+2)x^2 + (a^2 - 5a + 6)x + a^2 - 4 = 0$ is an identity in x is

A. 0

B. 2

C. 1

D. 3

Answer: C

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87. The value of a so that the sum of the squares of roots of the equation $x^2 - (a-2)x - a + 1 = 0$ assume the least value is

A. 0

B. 1

C. 2

D. 3

Answer: B

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88. If the roots of $x^2 + x + a = 0$ exceed , a then

A. $a = \frac{1}{2}$

B. $a < -2$

C. $a > -\frac{1}{2}$

D. a=2

Answer: B

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89. Out of the two roots of $x^2 + (1 - 2\lambda)x + (\lambda^2 - \lambda - 2) = 0$ one root is greater than 3 and the other root is less than 3, then the limits of λ are

A. $\lambda < 2$

B. $2 > \lambda < 5$

C. $\lambda > 5$

D. $\lambda = \frac{5}{2}$

Answer: B

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90. 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. (5, 6]

B. $(6, \infty)$

C. $(-\infty, 4)$

D. [4,5]

Answer: C

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91. If the roots of $x^2 - 2kx + k^2 - 1 = 0$ lie between -2 and 4 then the interval in which k lies, is

A. (-3,1)

B. (-3, 3)

C. (-1, 5)

D. (-1, 3)

Answer: D

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92. If a, b, c are real if $ax^2 + bx + c = 0$ has two real roots α, β where $a < -1, \beta > 1$ then

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

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

C. c=0

D. $\frac{c}{a}+\left|\frac{b}{a}\right|-1>0$

Answer: A

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93. If x is real then the range of $\frac{x^2-2x+9}{x^2+2x+9}$ 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: B

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

A. -1

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

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

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

Answer: D

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95. The set of values of x which satisfy $5x + 2 < 3x + 8$ and $\frac{x+2}{x-1} < 4$ is

A. (2, 3)

B. $(-\infty, 1) \cup (2, 3)$

C. $(-\infty, 1)$

D. (1, 3)

Answer: B

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96. The values of x for which $\frac{x-1}{3x+4} < \frac{x-3}{3x-2}$

A. $\left(-\infty, \frac{5}{4}\right)$

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

C. $\left(\frac{3}{4}, \infty\right)$

D. $\left(-\infty, -\frac{5}{4}\right) \cup (3/4, \infty)$

Answer: B

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97. The solution set 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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98. IF $\sqrt{9x^2 + 6x + 1} < (2 - x)$ then

A. (1, 3)

B. (0,1)

C. (1, 2)

D. (0, 2)

Answer: A

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99. 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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100. $\left\{x \in R : \frac{14x}{x+1} - \frac{9x-30}{x-4} < 0\right\} =$

A. (-1, 4)

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

C. (1, 7)

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

Answer: D

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101. If $3x^2 + 4kx + 1 > 1$ for all real values of x, then k lies in the interval

A. $\left(\frac{-\sqrt{3}}{2}, \frac{\sqrt{3}}{2}\right)$

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

C. $\left[\frac{-\sqrt{3}}{2}, \frac{\sqrt{3}}{2}\right]$

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

Answer: A

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102. I) For $x \in (2, 4)$ the sign of $x^2 - 6x + 5$ is negative

II) For $x \in (-\infty, 2) \cup (4, \infty)$ the sign of $x^2 - 6x + 5$ is positive then

Which of the above statement (s) is /are true

A. only I

B. only II

C. both I and II

D. neither I nor II

Answer: A

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103. Observe the following lists

List - I	List - II
A) $x^2-4x+3>0$	1) $(3, 4)$
B) $x^2-5x+6\leq 0$	2) $(-1, 1)\cup(2, 4)$
C) $x^2+6x-27>0$, $-x^2+3x+4>0$	3) $(-\infty,1)\cup(3,\infty)$
D) $x^2-3x+4<0, x^2-3x+2>0$	4) $[3, 4]$
	5) $[2, 3]$

Then the correct matching of solutions of inequalities is

A.
A	B	C	D
1	2	3	4

B.
A	B	C	D
3	5	1	2

C.
A	B	C	D
1	3	5	4

D.
A	B	C	D
3	2	4	1

Answer: B

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104. If $x^2 + bx + x = 0$ has no real roots and $a + b + c < 0$ then

A. $4a + 2b + x > 0$

B. $a - b + c = 0$

C. $c < 0$

D. $a + b + c = 0$

Answer: C

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105. Assertion (A): The maximum value of $\log_{1/3}\left(x^2 - 4x + 5\right)$ is zero

Reason (R): $\log_a x \leq 0$ for $x \geq 1$ and $0 < a < 1$

A. Both (A) (R) are true and (R) is the correct explanation of (A)

B.) Both (A) and (R) are false

C. (A) is true but (R) is false

D. Both (A) and (R) are true but (R) is not correct explanation of (A)

Answer: A

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106. Assertion (A), The equation $x^2 + 2|x| + 3 = 0$ has no real root.

Reason (R): In a quadratic equation $ax^2 + bx + c = 0, a, b, c \in R$ discriminant is less than zero then the equation has no real root.

A. Both A, R are true and R explain A

B. Both A, R are true but R does't explain A

C. A is true R is false

D. A is false R is true

Answer: A

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107. Assertion(A): $x^2 + x + 1 > 0$ for all positive real values of x only.

Reason (R) : When $b^2 - 4ac < 0, a, ax^2 + bx + x$ have same sign for all real values of x.

A. Both A, R are true and R explain Assertion

B. Both A, R are true but R does't explain A

C. A is true R is false

D. A is false R is true

Answer: D

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108. If $x^2 + 4xy + 4y^2 + 4x + cy + 3$ can be written as the product of two linear factors then c=

A. -8

B. -2

C. 2

D. 8

Answer: D

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109. If $x^2 + 4y^2 - 8x + 12 = 0$ is satified by real values of x nad y then y must lies between

A. 2, 6

B. 2, 5

C. -1, 1

D. -2, -1

Answer: C

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110. 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=a

C. a+c=b

D. b=c

Answer: A

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111. 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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112. α, β are the roots of $ax^2 + bx + c = 0$ and γ, σ are the roots of $px^3 + qx + r = 0$ and $D_1 : D_2$ be the respective discrimination of these equations .If $\alpha, \beta\gamma$ and δ are in A.P then $D_1 : D_2$=

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

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

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

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

Answer: A

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

A. 3

B. 2

C. 1

D. 0

Answer: C

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114. IF

$a = \cos\left(\frac{2\pi}{7}\right) + i\sin\left(\frac{2\pi}{7}\right), \alpha = a + a^2 + a^4$ and $\beta = a^3 + a^5 + a^6$

then α, β are the roots of the equation

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

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

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

D. $x^2 + 2x + 3 = 0$

Answer: B

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115. The roots of $(x-b)(x-c)+(x-a)(x-c)+(x-a)(x-b)=0$ are

A. a+b+c=0

B. $a+bw+cw^2=0$

C. a-b+c=0

D. a+b-c=0

Answer: B

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116. 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 $\frac{9\tan^2 x+6\tan x+4}{9\tan^2 x-6\tan x+4}$ lies are

A. 0 and 2

B. -1 and 1

C. -2 and 0

D. $1/3$ and 3

Answer: D

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117. If a,b,c are the sides of a triangle then the range of $\frac{a^2+b^2+c^2}{ab+bc+ca}$ is

A. [1,2)

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

C. [2,3]

D. (-1,3)

Answer: A

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118. If the equation $(\cos p - 1)x^2 + \cos px + \sin p = 0$ in the varable x has real roots then p can taken any value in the interval

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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119. If $x_1, x_2 = 3, x_3 + x_4 = 12$ and x_1, x_2, x_3, x_4 are in increasing G.P then the equation having x_1, x_2 as roots is

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

B. $x^2 - 6x + 8 = 0$

C. $x^2 - 12x + 32 = 0$

D. $x^2 - 9x + 8 = 0$

Answer: A

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120. If $p(x) = ax^2 + bx + c$ and $Q(x) = -ax^2 + dx + c$ where $ac \neq 0$ then the equation $P(x).\ Q(x) = 0$ has atleast

A. two real roots

B. two negative roots

C. two positive roots

D. one positive root and one negative root

Answer: A

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

A. A.P

B. G.P

C. H.P

D. A.G.P

Answer: A

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Practice Exercise

1. If $\frac{3x+2}{2x+3}=\frac{4x+3}{3x+4}$, then x =

A. ± 2

B. ± 4

C. ± 1

D. ± 3

Answer: C

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

A. 1, -1

B. 1, $\frac{(a-c)}{(b-c)}$

C. 1, $\frac{(a-b)}{(b-c)}$

D. 1, $\frac{(b-a)}{(b-c)}$

Answer: C

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3. A root of the equation $(x-2)(x-3)=\frac{155\times 78}{(77)^2}$

A. $\frac{309}{77}$

B. $\frac{155}{77}$

C. $\frac{78}{77}$

D. $\frac{81}{77}$

Answer: A

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4. A root of the equation $\frac{a+c}{x+a}+\frac{b+c}{x+b}=\frac{2(a+b+c)}{x+a+b}$ is

A. a

B. b

C. c

D. a+b+c

Answer: C

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5. If $(x-a+2b)^2+(x-2a+b)^2=(a+b)^2$, then one value of x is

A. a-b

B. 2a-b

C. a+b

D. a+3b

Answer: B

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6. If α, β are the rootsof $6x^2-4\sqrt{2}x-3=0$, then $\alpha^2\beta+\alpha\beta^2$ is

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

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

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

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

Answer: D

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7. Assertion (A): If α, β are the roots of $x^2 - x + 1 = 0$, then $\alpha^5 + \beta^5 = 1$

Reason (R) : The roots of $x^2 - x + 1 = 0$ are ω, ω^2.

A. Both A, R are true and R explain Assertion

B. Both A, R are true but R does't explain A

C. A is true R is false

D. A is false R is true

Answer: C

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8. If α, β are the roots of $ax^2 + bx + c = 0$ then $\alpha^5\beta^8 + \alpha\beta^5 =$

A. $\left(c^5 \frac{3abc - b^3}{a^8}\right)$

B. $\left(c^3 \frac{3abc - b^3}{a^5}\right)$

C. $\left(a^2 \frac{3abc - b^3}{c^5}\right)$

D. $\left(a^3 \frac{3abc - b^3}{c^5}\right)$

Answer: A

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9. If w, w^2 are the roots of $x^2 + x + 1 = 0$ and α, β are the roots of $x^2 + px + q = 0$ then $\left(w\alpha + w^2\beta\right)\left(w^2\alpha + w\beta\right)$ =

A. $p^2 - 3q$

B. $p^2 - 2q$

C. p-q

D. $q^2 - 3p$

Answer: A

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10. If the roots $ax^2 + bx + c = 0$ are $\frac{3}{2}, \frac{4}{3}$ then $(a + b + c)^2$ =

A. $\frac{a^2}{36}$

B. $\frac{a^2}{6}$

C. $\frac{a^2}{25}$

D. $\frac{a^2}{5}$

Answer: A

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11. If a, b are the roots of $x^2 + x + 1 = 0$, then $a^2 + b^2$ is

A. ab

B. $a^3 + b^3$

C. 2ab

D. $a^{-2} + b^{-2}$

Answer: D

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12. If α, β are the roots of $x^2 + x + 1 = 0$, then $\alpha^{-2} + \beta^{-2}$ is

A. $\sqrt{-1}$

B. $-i\sqrt{3}$

C. -1

D. $-i\sqrt{3}$

Answer: C

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13. If α, β are the roots of $ax^2 + bx + c = 0$, $\alpha\beta = 3$ and a, b, c are in A.P., then $\alpha + \beta$ =

A. -4

B. -1

C. 4

D. -2

Answer: D

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14. If α, β are the roots of $x^2 + ax + 12 = 0$ such that $\alpha - \beta = 1$, then a =

A. 7

B. -7

C. ± 1

D. ± 7

Answer: D

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15. The values of P for which the difference between the roots of the equation $x^2 - px + 10 = 0$ is 3 are

A. ± 3

B. ± 5

C. ± 6

D. ± 7

Answer: D

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16. IF the different between the roots of $x^2 - px + q = 0$ is 2, then the relation between p , and q is

A. $p = 4(q+1)^2$

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

C. $p^2 = 4(q+1)$

D. p=4(q+1)

Answer: C

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17. If x-2 is a factor of $x^2 + 6x + 16b$, then b =

A. 1

B. 0

C. 2

D. -1

Answer: D

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18. If the sum of the roots of $kx^2 + 2x + 3k = 0$ is equal to their product, then k =

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

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

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

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

Answer: C

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19. If the sum of the roots of $x^2 + bx + 1 = 0$, is equal to the sum of their squares, then b =

A. 1, 2

B. 1, -2

C. -1, 2

D. -1, -2

Answer: B

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

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

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

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

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

Answer: D

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

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

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

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

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

Answer: C

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22. IF α, β are the roots of $9x^2 + 6x + 1 = 0$ then the equation with the roots $1/\alpha, 1/\beta$ is

A. $2x^2 + 3x + 18 = 0$

B. $x^2 + 6x - 9 = 0$

C. $x^2 + 6x + 9 = 0$

D. $2x^2 + 3x + 9 = 0$

Answer: C

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23. The equation whose roots are double the roots of the equation $x^2 + 6x + 3 = 0$ is

A. $2x^2 + 12x + 6 = 0$

B. $4x^2 + 12x + 3 = 0$

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

D. $2x^2 + 12x + 12 = 0$

Answer: C

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24. The equation formed by increasing each roots of $2x^2 - 3x - 1 = 0$ by 2 is

A. $2x^2 + 5x + 1 = 0$

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

C. $2x^2 - 11x - 18 = 0$

D. $2x^2 - 11x + 13 = 0$

Answer: D

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25. If one root of $x^2 + kx + 12 = 0$ may be the triple the other , then k=

A. ± 8

B. 3

C. $\pm 5\sqrt{10}$

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

Answer: A

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26. Let α and β be the roots of the quadratic equation $ax^2 + bx + c = 0$, observe the lists given below :

List - I	List - II
A) $\alpha = \beta \Rightarrow$	1) $(ac^2)^{\frac{1}{3}} + (a^2c)^{\frac{1}{3}} + b = 0$
B) $a = 2\beta \Rightarrow$	2) $2ab^2 = 9ac$
C) $a = 3\beta \Rightarrow$	3) $b^2 = 6ac$
D) $a = \beta^2 \Rightarrow$	4) $3b^2 = 16ac$
	5) $b^2 = 4ac$
	6) $(ac^2)^{\frac{1}{3}} + (a^2c)^{\frac{1}{3}} = b$

The correct match is

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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27. If one root of the equation $x^2 + px + q = 0$ is the square of the other, then $p^3 + q^3$ =

A. q(3p + 1)

B. -q(3p + 1)

C. q(3p - 1)

D. q(1-3p)

Answer: C

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28. If $\alpha + \beta = 3$ and $a^3 + \beta^3 = 7$, then α and β are the roots of the equation

A. $9x^2 + 27x + 20 = 0$

B. $9x^2 - 27x + 20 = 0$

C. $9x^2 + 27x - 20 = 0$

D. $9x^2 - 27x - 20 = 0$

Answer: B

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29. The equation whose roots are smaller by 1 then those of $2x^2 - 5x + 6 = 0$ is

A. $2x^2 - 9x + 13 = 0$

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

C. $2x^2 + 9x + 13 = 0$

D. $2x^2 + x + 3 = 0$

Answer: B

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30. Assertion (A): The roots of the equation $2x^2 - 15x + 4 = 0$ are each increased by 3, then the new equation is $2x^2 - 27x + 67 = 0$

Reason (R): The equation whose roots are increased by k then those of f(x) = 0 is $f(x/k) = 0$

A. Both A, R are true and R explain Assertion

B. Both A, R are true but R does't explain A

C. A is true R is false

D. A is false R is true

Answer: C

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31. The equation formed by decreasing each root of $ax^2 + bx + c = 0$ by 2 is $x^2 + 4x + 3 = 0$ then

A. b = 1, a + c = 0

B. b = 2, a + c = 0

C. b = 0, a + c = 0

D. b = 0, a-c=0

Answer: C

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32. If α, β are the roots of $x^2 + 3x + 1 = 0$, then the equation whose roots $2 - \alpha, 2 - \beta$ is

A. $x^2 + 7x + 10 = 0$

B. $x^2 - 7x + 11 = 0$

C. $x^2 + 4x + 11 = 0$

D. $x^2 + 4x + 10 = 0$

Answer: B

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33. If α, β are the roots of $2x^2 + 5x + 2 = 0$, then the equation with roots $\frac{1}{\alpha + 1}, \frac{1}{\beta + 1}$ is

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

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

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

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

Answer: B

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34. The number of integral solutions of $2\left(x^2+\frac{1}{x^2}\right)-7\left(x+\frac{1}{x}\right)+9=0$ when $x \neq 0$ is

A. 1

B. 2

C. 4

D. 0

Answer: C

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35. IF $3+i$ is a root of the equation $x^2+ax+b=0$ then a=

A. 3

B. -3

C. 6

D. -6

Answer: D

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36. The roots of the equation $x^2 - 2ax + 8a - 15 = 0$ are equal, then a =

A. 3 or 2

B. 3 or 5

C. 5 or 2

D. ± 2

Answer: B

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37. If one root of the equation $Ix^2 - 2(1+i)x + (2-i) = 0$ is 2- I then the root is

A. 2 + i

B. 1-2i

C. 1

D. -i

Answer: D

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38. If x = 1 + i is a root of the equation $x^2 - ix - 1 - i = 0$ then the other real root is

A. 1

B. -1

C. 0

D. 2

Answer: B

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39. Assertion (A) : If the roots of $(b-c)x^2+(c-a)x+(a-b)=0$ are equal then a, b, c are in A.P.

Reason (R): If in $ax^2+bx+c=0$, sum of the coefficients is equal to zero then c = a

A. Both A, R are true and R explain Assertion

B. Both A, R are true but R does't explain A

C. A is true R is false

D. A is false R is true

Answer: C

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40. If $x^2 - (5m - 2)x + 4m^2 + 10m + 25$ is a perfect square then m =

The roots of the equation $x^2 + 2ax + a^2 + b^2 = 0$ are

A. rational and equal

B. rational and not equal

C. irrational

D. imaginary

Answer: C

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41. The roots of the equation $x^2 + 2ax + a^2 + b^2 = 0$ are

A. real and equal

B. real and unequal

C. imaginary

D. cannot be determind

Answer: D

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42. The roots of the equation $2\left(a^2+b^2\right)x^2+2(a+b)x+1=0$ are

A. real and equal

B. real and unequal

C. complex numbers

D. cannot be determind

Answer: C

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43. For p, $q \in R$, the roots of $\left(p^2+2\right)x^2+2x(p+q)-2=0$ are

A. real and equal

B. real and unequal

C. complex numbers

D. cannot be determind

Answer: B

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44. If the equation $x^2 - x + m^2 = 0$ has no real roots then m can satisfy

A. m=0

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

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

D. $m \in R$

Answer: B

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45. If the roots $\frac{1}{x+k+1}+\frac{2}{x+k+2}=1$ are equal in magnitude but opposite in sign, then k =

A. -1

B. 0

C. 1

D. 2

Answer: B

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46. The roots of the equation $5x^2+10x-7=0$ are

A. Positive

B. Negative

C. of oppsote signs

D. rational

Answer: C

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47. 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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48. If the roots of $ax^2 + bx + c = 0$ are equal in magnitude but opposite in sign, then

A. $a < 0, c < 0$

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

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

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

Answer: C

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49. If the roots of $ax^2 + bx + c = 0$ are both positive and $b < 0$, then

A. $a < 0, c < 0$

B. $a < 0, c < 0$

C. $a > 0, c < 0$

D. $a > 0, c > 0$

Answer: D

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50. The value of 'a' for which the quadratic equation $2x^2 - x\left(a^2 + 8a - 1\right) + a^2 - 4a = 0$ has roots with opposite signs, lie in the interval

A. $1 < a < 5$

B. $0 < a < 4$

C. $-1 < a < 2$

D. $2 < a < 6$

Answer: B

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

A. a, c

B. b, c

C. a, b

D. a + c, b + c

Answer: C

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52. The equation $|x|^2 - |x| - 6 = 0$ has

A. one real solution

B. two real solutions

C. three real solutions

D. four real solutions

Answer: B

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53. If $\left|x^2\right| - 3|x| + 2 = 0$ then x =

A. 1 or 2

B. -1 or -2

C. ± 1 or ± 2

D. ± 3

Answer: C

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54. Solutions of the equation x|x+1|+1=0 are

A. $\frac{1}{2}(1 \pm \sqrt{5})$

B. $\frac{-1}{2}(-1 \pm \sqrt{5})$

C. $\frac{1}{2}(-1 + \sqrt{5})$

D. $\frac{1}{2}(-1 - \sqrt{5})$

Answer: D

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55. If m is a positive integer then the solutions of $x^{\frac{2}{5}} - 5x^{\frac{1}{m}} + 4 = 0$ are

A. $1, 2^m$

B. $1, 3^m$

C. $1, 4^m$

D. $1, 5^m$

Answer: C

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56. If the sum of the roots of $ax^2 + bx + c = 0$ is equal to the sum of the reciprocals of their squares then bc^2, ca^2, ab^2 are in

A. A.P.

B. H.P.

C. G.P.

D. A.G.P

Answer: A

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57. If $a \neq 0$, then the equation $\frac{x-a-1}{x-a} = (a+1) - \frac{1}{x-a}$ has

A. two roots

B. one root

C. no root

D. many roots

Answer: B

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58. The number of real solutions of the equation $\left(\frac{9}{x}\right)^{x} = -3 + x - x^2$ is

A. 0

B. 1

C. 2

D. infinite

Answer: A

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59. Solve $x^{2/3} + x^{1/3} - 2 = 0$

A. 1

B. 2

C. 3

D. 4

Answer: B

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60. If the equations $x^2 - ax + bc = 0$ and $x^2 + bx + ca = 0$ have a common root, then a + b + c =

A. 0

B. 1

C. -1

D. 3abc

Answer: A

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61. If the equation $x^2 + ax + b = 0$ and $x^2 + bx + a = 0$ have a common root, then their other roots satisfy the equation

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

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

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

D. $x^2 - x - ab = 0$

Answer: A

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62. Suppose the that quadratic equations $ax^2 + bx + c = 0$ and $bx^2 + cx + a = 0$ have a common root. Then show that $a^3 + b^3 + c^3 = 3abc.$

A. 3

B. 2

C. 1

D. 4

Answer: A

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63. IF $x^2 + bx + a = 0, ax^2 + x + b = 0$ have a common root and the first equation has equal roots then $2a^2 + b =$

A. 0

B. -1

C. 1

D. 2

Answer: A

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64. If the quadratic equation $ax^2 + 2cx + b = 0$ and $ax^2 + 2x + c = 0$ ($b \neq c$) have a common root then a + 4b + 4c is equal to

A. -2

B. -1

C. 0

D. 1

Answer: C

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65. the expression $2x^2 + 4x + 7$ has minimum value m at $x = \alpha$. The ordered pair (α, m) is

A. (1, -5)

B. (-1, -5)

C. (-1,5)

D. (1, 5)

Answer: C

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66. The maximum value of the expression $\frac{x^2+x+1}{2x^2-x+1}$, for $x \in R$, is

A. $\frac{7+2\sqrt{7}}{7}$

B. $\frac{7-2\sqrt{7}}{7}$

C. $\frac{7}{3}$

D. $\frac{14+2\sqrt{7}}{7}$

Answer: A

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67. A = The maximum value of $4x^2 + 4x + 5$

B = The maximum value of $8x - x^2$

C = The maximum value of $-x^2 + 4x - 4$

D = The maximum value of $-7x^2 + 100$ then

A. $B < D < A < C$

B. $B < C < A < D$

C. $C < A < B < D$

D. $A < D < C < B$

Answer: C

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

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

B. $(3. \infty)$

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

D. [-1, 1]

Answer: C

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69. Out of the two roots of $x^2 - 2\lambda x + \lambda^2 - 1 = 0$, one is greater than 4 and the other root is less than 4, then the limits of λ are

A. $3 < \lambda < 5$

B. $\lambda < 3$

C. $\lambda < 5$

D. $5 < \lambda < 6$

Answer: A

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70. Assertion (A): The roots of $ax^2 + bx + c = 0$, where $a \neq 0$, b, $c \in R$ are non-real complex and $a + c < b$. Then $4a + c < 2b$

Reason (R): If the quadratic equation $ax^2 + bx + c = 0$ has imaginary roots then $\forall x \in R\, ax^2 + bx + c$ have same sign

A. Both A, R are true and R explain Assertion

B. Both A, R are true but R does't explain A

C. A is true R is false

D. A is false R is true

Answer: A

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71. If x $\in$ R, then the range of $\frac{x}{x^2 - 5x + 9}$ is

A. 1

B. 2

C. 3

D. 0

Answer: A

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72. If $4 < x < 8$ then the value of $12x - x^2 - 32$ is

A. Zero

B. Positive

C. Negative

D. Not determinable

Answer: B

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73. The greatest positive integral value of x for which 200 - x(10 + x) is positive is

A. 9

B. 10

C. 8

D. 11

Answer: A

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74. The range of values of x which satisfy $2x^2 + 9x + 4 < 0$ and $x^2 - 5x + 6 < 0$ is

A. (-2,-1)

B. $\left(\frac{1}{2}, 4\right)$

C. (2, 3)

D. ϕ

Answer: D

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75. If $x^2 + 6x - 27 > 0, \ -x^2 + 3x + 4 < 0$, then x lies in the interval

A. $(-\infty, -9) \cup (4, \infty)$

B. [3, 4]

C. $(-\infty, 3) \cup (4, \infty)$

D. (-9, 4)

Answer: A

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76. If $4x^2 + kx + 3 \geq 0$ for all real values of x then k lies in the interval

A. $(-3\sqrt{3}, 4\sqrt{3})$

B. $[-4\sqrt{3}, 4\sqrt{3}]$

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

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

Answer: B

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77. The greatest negative integer satisfying $x^2 - 4x - 77 < 0$ and $x^2 > 4$ is

A. -2

B. -3

C. -1

D. -7

Answer: B

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78. IF the inequation $\sqrt{3x-8} < -2$ then

A. ϕ

B. [1, 2]

C. $[12, \infty)$

D. (1, 2]

Answer: A

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79. The range of values of x for which the inequality $\frac{x-1}{4x+5} < \frac{x-3}{4x-3}$ holds is

A. $\left(\frac{-4}{3}, \frac{5}{8}\right)$

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

C. $\left(\frac{-5}{4}, \frac{3}{4}\right)$

D. (3, 8)

Answer: C

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80. If $\sqrt{2x-4} \leq 2-x$, then the range of x is

A. $(-\infty, 2)$

B. $(2, \infty)$

C. (2, 4)

D. {2}

Answer: D

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81. The integer k for which the inequality $x^2 - 2(4k-1)x + 15k^2 - 2k - 7 > 0$ is valid for any x, is

A. 2

B. 3

C. 4

D. 0

Answer: B

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82. If $x^2 - y^2 + 4x - 6y + k$ is resolvable into two linear factors, then k =

A. -1

B. 4

C. 6

D. -5

Answer: D

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83. If $x^2 + 4y^2 - 8x + 12 = 0$ is satified by real values of x nad y then y must lies between

A. 2, 6

B. 2, 5

C. -1, 1

D. -2, -1

Answer: A

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84. The quadratic equation $ax^2 + bx + c = 0$ has two roots then match the following lists.

List - I	List - II
A) both the roots are negative	1) $b = 0, ac < 0$
B) both roots have opposite sign	2) $a>0, b>0, c>0$
C) both roots are positive	3) $ac<0$
D) both roots are equal in magnitude and opposite in sign	4) $b<0, a>0, c>0$

Find the correct match from List-I to List-II.

A. $\begin{matrix} A & B & C & D \\ 3 & 2 & 4 & 1 \end{matrix}$

B. $\begin{matrix} A & B & C & D \\ 2 & 3 & 4 & 1 \end{matrix}$

C. $\begin{matrix} A & B & C & D \\ 3 & 2 & 1 & 4 \end{matrix}$

D. $\begin{matrix} A & B & C & D \\ 2 & 1 & 3 & 4 \end{matrix}$

Answer: B

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85. If a and b are the non-zero roots of the equation $x^2 + ax + b = 0$, then the least value of the expression $x^2 + ax + b$ is

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

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

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

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

Answer: D

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86. If one root is the n^{th} power of the other root of the equation $x^2 - ax + b = 0$ then $b^{\frac{n}{n+1}} + b^{\frac{1}{n+1}}$=

A. ab

B. a^n

C. a

D. b^n

Answer: C

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87. The values of x for which the inequality $\frac{8x^2+16x-51}{(2x-3)(x+4)} > 3$ holds, are

A. $x \geq 4$

B. $-4 \leq x \leq -3$

C. $\frac{3}{2} < x < \frac{5}{2}$ or $x < \frac{5}{2}$ or $-3 < x < \frac{3}{2}$

D. $x < -4$ or $x > \frac{5}{2}$ or $-3 < x < \frac{3}{2}$

Answer: D

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88. If $\left|\frac{x^2+kx+1}{x^2+x+1}\right| < 3$ for real x, then k is in the interval

A. (-0, -1)

B. (-1, 6)

C. (-1, 5)

D. $(6, \infty)$

Answer: C

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