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QUADRATIC EQUATION & EXPRESSIONS

Basic Quadratic Equation

1.Prove that the roots of the quadratic equation ax2 – 3bx – 4a=0 are real and distinct for all real a and b.

2.Find the value of m for which the equation (1+m)x2 – 2(1+3m)x+(1+8m)=0 has equal roots.

3.If α and β be roots of equation ax2+bx+c=0, prove that $\left[\frac{a}{\beta}+\frac{\alpha 2}{\alpha}\right]+\left[\frac{\beta 2}{\beta}+\frac{b}{\alpha}\right]\alpha+\beta=b$

4.(i)Show that if the roots of the equation (a2 + b2)x2 + 2x(ac+bd)+c2+d2 =0 are real, they will be equal.
(ii) Find for what value of 'a' equation x2+2x – (a3 – 3a – 3)=0 has real roots.
(iii) Prove that the roots of the equation bx2 + (b – c)x +(b – c – a)=0 are real if those of ax2+2bx+b=0 are imaginary.
(iv)If α, β are the roots of the equation x2 – px+q=0 and α1 , β1 be the roots of the equation x2 – qx +p=0, then from the quadratic equation whose roots are $\left[\frac{1}{\alpha 1\beta}+\frac{1}{\alpha\beta 1}\right]$ and $\left[\frac{1}{\alpha\alpha 1}+\frac{1}{\beta\beta 1}\right]$

Condition for two Q.D. to have a Common Roots

5.Find the value of p if the equation 3x2 – 2x+p=0 and 6x2 – 17x +12=0 have a common root.
6.(i) If two equations x2+cx+ab=0 and x2+bx+ca=0 have a common root, then show that a+b+c=0.
(ii)Prove that equations (q – r)x2+ (r – p)x +p – q =0 and (r – p)x2 + (p – q)x + q – r=0 have a common root.
(iii)If the equations ax2 + bx+c=0 and x2+2x+4=0 have a common root then find a:b:c.
(iv) If the equations x2 + 3x+5=0 and ax2+bx+c=0 have a common root and a,b,c ∈ N then find the minimum value of a+b+c.

Relation Between the Roots of a Polynomial Equation of Degree n

7. Let a and b be two roots of the equation x3+px2+qx+r=0 satisfying the relation ab+1=0. Prove that r2+pr+q+1=0. (r≠0)
8.If b2<2ac, then prove that ax3+bx2+cx+d=0 has exactly one real root.
9.(i) Find the roots α,β,γ of x3 – 11x2+36x – 36=0 if 2/β = 1/α + 1/γ .
(Ii)If the roots of x3+px2+qx+r=0 are in G.P., find the relation between p,q,r.
(iii) In a triangle PQR; angle R = π/2. If tan (P/2) and tan(Q/2) are roots of the equation ax2 + bx+c=0, (a≠0), then show that a+b – c=0.
(iv) Prove that x6 + x4 + x2 + x+3=0 has no positive real roots.

The Method of Intervals (Wavy Curve Method)

10. Let $f(x)=\frac{(x-3)(x+2)(x+5)}{(x+1)(x-7)}$. Find intervals, where f(x) is positive or negative.

11.Find the set of all x for which $\frac{2x}{2x2+5x+2} > \frac{1}{x+1}$

12.(i)Solve the inequality $\frac{x-1}{x2-4x+3} < 1$.

(ii)Solve $\frac{(x-1)2(3x+2)70(x2+x+1)31}{(x-7)(3x-7)71\,(x+3)\,x99} \le 0$.

(iii) Find the solution set of $\frac{(x-1)(x-2)2\,(x+4)}{(x+2)\,(x-3)} \ge 0$

(iv)Find the solution set of $\frac{|x-1|\,(x-3)\,(x-5)2010}{(|x|-3)(|x|+1)} \ge 0$

QUADRATIC EXPRESSION

13. Let f(x) be a quadratic expression which is positive $\forall \times \in R$. If $g(x) = f(x) + f'(x)+f''(x)$, then prove that $g(x) > 0\ \forall \times \in R$.

14. A real number 'a' is a called a good number if the inequality $\frac{2x^2+2x+3}{x^2+x+1} \le a$ is satisfied for all real x. Find the set of all good real numbers.

15.If $ax^2 - bx+5 = 0$ does not have 2 distinct real roots, then find the minimum value of 5a+b.

16.(i) If the equation $ax^2+bx+c=0$ does not have 2 distinct real roots and a+c>b, then prove that $f(x) \ge 0$, $\forall \times \in R$.

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

(iii)Let $y = \frac{x^2+3x+1,}{x^2+x+1}$ $\forall \times \in R$. Find the range of y.

(iv) Show that if x is real , the expression $\frac{x^2-bc}{2x-b-c}$ has no value between b and c.

INTERVAL In Which The Roots Lie

17.Find the values of the parameter a for which the roots of the quadratic equation $x^2+2(a-1)x+a+5 = 0$ are

(i)real and distinct, (ii) equal, (iii) not real, (iv) opposite in sign,
(v) equal in magnitude but opposite in sign, (vi) positive, (vii) negative,
(viii) such that one root is greater than 3, and the other is smaller than 3, (ix) greater than 3,
(x) smaller than 3, (xi)such that exactly one root lies in the interval (1,3),
(xii) such that both the roots lie in the interval (1,3),
(xiii) such that one root is greater than 3 and the other root is smaller than 1.

18.If α is a root of the equation $ax^2+bx+c=0$ and β is a root of the equation $-ax^2+bx+c=0$, then prove that there will be a root of the equation $a/2\ x^2 + bx+c=0$ lying between α and β

19.Find the values of 'a' for which $4^t - (a-4)2^t + 9/4\ a < 0\ \forall\ t \in (1,2)$.

20.(i) For what value of $a \in R$, the quadratic equation $(a^2+1)x^2 - (a+1)x +(a^2 - a - 2)=0$ will have roots of opposite sign.

(ii)For what values of a, does the equation $ax^2 - (a+1)x+3=0$, have roots lying between 1 and 2.

(iii) If the equation $x^2+ax - a^2 - 1=0$ has roots of opposite sign, then determine the interval in which 'a' lies.

(iv) If both the roots of $x^2 - ax+a=0$ are greater than 2, then determine the interval in which 'a' lies.

PROBLEMS

1.Find the range in which the value of the function $\frac{x^2+34x-71}{x^2+2x-7}$ lies for all real values of x.

2.If $\frac{x^2+ax+3}{x^2+x+a}$ takes all real values for possible real values of x then prove that $4a^3+39<0$.

3.Find the values of 'a' for which the equation. $(x^2+x+2)^2 - (a-3)(x^2+x+2)(x^2+x+1)+ (a-4)(x^2+x+1)^2=0$ has at least one real root.

4.Let S denotes the set for all real values of the parameter 'a' for which every solution of the inequality $\log_{1/2}x^2 \geq \log_{1/2}(x+2)$ is a solution of the inequality $49\,x^2 - 4a^4 \leq 0$. Find the S.

5.The real numbers x_1, x_2, x_3 satisfying the equation $x^3 - x + \beta x + \gamma = 0$ are in A.P. Find the intervals in which β and γ lie.

6.If α, β are the roots of $x^2 + px + q = 0$, and also of $x^{2n} + p^n x^n + q^n = 0$, and if α/β is a root of $x^n + 1 + (x+1)^n = 0$, then prove that n must be an even integer, where $\alpha^n \neq \beta^n$.

7.For what value of θ, 1 lies between the roots of the quadratic equation $3x^2 - 3\sin\theta\, x - 2\cos^2\theta = 0$

8.Let x,y,z be real variables satisfying the equation x+y+z=6 and xy+yz+zx=7. Then find the range in which the variables can lie.

9.Find the value of 'a' for which $ax^2 + (a-3)x + 1 < 0$ for at least one positive real x.

10.If $(y^2 - 5y + 3)(x^2 + x + 1) < 2x$ for all $x \in R$, then show that the interval in which y lies is $\left(\frac{5-\sqrt{5}}{2}, \frac{5+\sqrt{5}}{2}\right)$

OBJECTIVE

1.If α and β are the root of the equation $2x^2 - 3x - 6 = 0$, then equation whose roots are α^2+2, β^2+2, is

a) $4x^2 + 49x + 118 = 0$ b) $4x^2 - 49x + 118 = 0$ c) $4x^2 - 49x - 118 = 0$

d) $x^2 - 49x + 118 = 0$

2.If the roots of the equation $x^2 - px + q = 0$ differ by unity then

a) $p^2 = 1 - 4q$ b) $p^2 = 1 + 4q$ c) $q^2 = 1 - 4p$ d) $q^2 = 1 + 4p$

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

a) p=1,q= -2 b) p=0, q=1 c) p= -2, q=0 d) p= -2, q=1

4.If $a,b \in R$, $a \neq 0$ and the quadratic equation $ax^2 - bx + 1 = 0$ has imaginary roots, then a+b+1 is

a) positive b) negative c) zero d) depends on the sign of b

5.(α,β);(β,γ) and (γ,α) are respectively the roots of $x^2 - 2px + 2 = 0$, $x^2 - 2qx + 3 = 0$ and $x^2 - 2rx + 6 = 0$. If α, β, and γ are all positive, then the value of p+q+r is

6.The number of solutions(s) of the equation $|\sqrt{x} - 2| + \sqrt{x}(\sqrt{x} - 4) + 2 = 0$, is equal to

a)2 b)4 c) no solutions d) infinitely many solutions

7.If the expression $(mx - 1 + 1/x)$ is non- negative for all positive real x, then the minimum value of m must be

a) -1/2 b)0 c)1/4 d) 1/2

8.The set of values of p for which the roots of the equation $3x^2 + 2x + p(p-1) = 0$ are of opposite sign is

a) $(-\infty, 0)$ b)(0,1) c)$(1, \infty)$ d) $(0, \infty)$

9.If the inequality $\frac{mx^2 + 3x + 4}{} < 5$ is satisfied for all $x \in R$, then

a)1<m<5 b) -1<m<5 c)1<m<6 d) m<71/24

10.If $x^2 + ax + b$ is an integer for every integer x then

a) 'a' is always an integer but 'b' need not be an integer

b) 'b' is always an integer but 'a' need not be an integer

c) a and b are always integers.

d) none of these

11.If $x^2 - 4x + \log_{1/2}a = 0$ does not have two distinct real roots, then maximum value of a is

a) 1/4 b)1/16 c) -1/4 d) none of these

12.Sum of the roots of the equation $x^2 + 5|x| + 6 = 0$

a) equals to 5 b) equals to 10 c) equals to -5

d) does not exist

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

a) (0,2) b) (2,4) c) (0,1) d) (-2,0)

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

a) -4 b) -3 c)-1 d) -2

15.The complete set of value of x satisfying $\log_{x2}(x+1) > 0$ is

a)$(1,\infty)$ b)$(-1,2) \sim \{0\}$ c)$(-1,1) \sim \{0\}$ d)$(-1,0) \cup (1,\infty)$

ASSIGNMENT

SECTION – I (Part A)

Level – I

1.Let $x_2 - (m-3)x+m=0 (m \in R)$ be a quadratic equation. Find the value of m for which the roots

(i) are real and distinct, (ii) are equal (iii) are not real

(iv) are opposite in sign, (v) are equal in magnitude but opposite in sign,

(vi) are positive, (vii) are negative,

(viii) are such that at least one is positive.

2.If the roots of the equation $\frac{1}{x+p} + \frac{1}{x+q} = \frac{1}{r}$ are equal in magnitude but opposite in sign, show that p+q=2r and the product of the roots is $-1/2(p^2+q^2)$.

3.One of the roots of the equation $x^2+px+q=0$ $(p,q \in R)$ is $a + ib (b \neq 0)$. Show that q>0 and also a<0 if and only if p>0.

4.The coefficient of x in the quadratic equation $x^2+px+q=0$ was taken as 17 in place of 13. Its roots were found to be -2, and -15. Find the roots of the original equation.

5.Prove that the arithmetic mean of the roots of $x^2 - 2ax+b^2=0$ is equal to the geometric mean of the roots of the equation $x^2 - 2bx+a^2=0$.

6.If the ratio of the roots of the quadratic equation $x^2+px+q=0$ be equal to the ratio of the roots of $x^2+lx+m=0$, then prove that $p^2m=l^2q$.

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

8.Solve the following equations:

(i) $\sqrt{3x+1} - \sqrt{x-1} = 2$ (ii) $\frac{\sqrt{x}}{\sqrt{1-x}} + \frac{\sqrt{1-x}}{\sqrt{x}} = \frac{13}{6}$

(iii) $5^{2x} - 5^{x+3} + 125 = 5^x$ (iv) $6^x + 6^y = 42, x+y=3$

9.If the roots of the equation $(b-c)x^2+(c-a)x+(a-b)=0$ be equal, then prove that a,b,c are in arithmetic progression.

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

LEVEL – II

1.Let $x^2 - (m-3)x+m=0$, $(m \in R)$ be a quadratic equation. Find the value of m for which

(i) one root is smaller than 2, the other root is greater than 2

(ii) both the roots are greater than 2

(iii) both the roots are smaller than 2

(iv) exactly one root lies in the interval (1,2)

(v)both the roots lie in the interval (1,2)

(vi) atleast one root lies in the interval (1,2)

(vii) one root is greater than 2, the other root is smaller than 1

(viii) atleast one root is greater than 2.

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

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

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

5.Find the values of 'a' so that two of the roots of the equation $(a-1)(x^2+x+1)^2 = (a+1)(x^4+x^2+1)$ are real and distinct.

6.If α,β be the roots of the equation $\lambda^2(x^2-x)+2\lambda x+3=0$ and λ_1, λ_2 be the two values of λ for which α and β are connected by the relation $\frac{\alpha}{\beta}+\frac{\beta}{\alpha}=\frac{4}{3}$, then find the equation whose roots are $\frac{\lambda_1^2}{\lambda_2}$ and $\frac{\lambda_2^2}{\lambda_1}$

7.(i)Find a for which $x^2-x+a-3<0$ for at least one negative x.

(ii)If $a<b<c<d$, then prove that for any real λ, the quadratic equation $(x-a)(x-c)+\lambda(x-b)(x-d)=0$ has real roots.

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

9.If four distinct points on the curve $y=2x^4+7x^3+3x-5$ are collinear, then find the arithmetic mean of x – coordinates of the aforesaid points.

10.For what integral values of 'a' the equation $x^2-x(1-a)-(a+2)=0$ has integral roots.

11.(i)Suppose $p\neq p'$ and $q\neq q'$. If the equation $x^2-px+q=0$ and $x^2+p'x+q'=0$ have a common root, then show that it is equal to $\frac{pq'-p'q}{q-q'}$ or $\frac{q-q'}{p'-p}$

(ii)If the three equations $x^2+ax+12=0$, $x^2+bx+15=0$ and $x^2+(a+b)x+36=0$ have a common positive root, fnd a and b and the roots of the equations.

12.If x_1,x_2 are the roots of $x^2-3x+a=0$ and x_3,x_4 are those of the equation $x^2-12x+b=0$ and x_1,x_2,x_3,x_4 are in increasing G.P., find a and b.

13.(i)Solve the equation $\log_4(2x^2+x+1)-\log_2(2x-1)=1$.

(ii) Solve the equation $2^{|x+2|}-|2^{x+1}-1|=2^{x+1}+1$.

PART – B

(Multiple Choice Questions(Single Option Correct)

1.If $|x^2|+|x|-2=0$, then the value of x is equal to

a) 2 b) -2 c) ± 1 d) none of these

2.If $b\in R^+$ then the roots of the equation $(2+b)x^2+(3+b)x+(4+b)=0$ is

a) real and distinct b) real and equal c) imaginary

d) cannot predicted

3.One root of the quadratic equation $\sin^2\theta\, x^2-x+\cos^2\theta=0$ is given by

a) -1 b) $\tan^2\theta$ c) $\cot^2\theta$ d)2

4.If the roots of the equation $\frac{x^2-bx}{ax-c}=\frac{\lambda-1}{\lambda+1}$ are equal and opposite in sign, then the value of λ is

a)(a – b)/(a+b) b) c c) 1/c d) (a+b)/(a – b)

5.If one root of the equation $x^2-x-k=0$ be square of the other, then k is equal to

a)$2\pm\sqrt{3}$ b) $3\pm\sqrt{2}$ c)$2\pm\sqrt{5}$ d)$5\pm\sqrt{2}$

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

a)-5 b) -6 c) -3 d) none of these

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

a)real and equal b) complex c) real and unequal

d)none of these

8.If x is real, then the least value of the expression $\frac{x^2-6x+5}{x^2+2x+1}$ is

a) -1 b) -1/2 c) -1/3 d) none of these

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

a) 0,2 b) ± 1 c) ± 2 d) 1,2

10.If the equation $x^2+ax+b=0$ and $x^2+bx+a=0$ have exactly one common root, then the numerical value of a+b is

a) 1 b) -1 c) 0 d) none of these

11.If x_1,x_2 are the roots of $x^2-3x+a=0$, $a\in R$ and $x_1<1<x_2$ then a belongs to

a) $(-\infty,2)$ b) $(-\infty,9/4)$ c) $(2,9/4)$ d) none of these

12.Let [a] denotes the greatest integer less than or equal to a. Given that the quadratic equation $x^2+[a^2-5a+b+4]x+b=0$ has roots -5 and 1, then the number of integral values of a is

a)3 b) 2 c)1 d)0

13. If $f(x)=ax^2+bx+c=0$,where $a\neq0$, $f(5)+3f(2)=0$ and 3 is a root of f(x), then the other root of f(x)=0 is

a) -1 b) -4 c) -2 d)-3

14.If $x^2-(a-3)x+a=0$ has atleast one positive root then 'a' belong to

a)$(-\infty,0)\cup[7,9]$ b) $(-\infty,0)\cup[7,\infty)$ c) $(-\infty,0)\cup[9,\infty)$ d) $(-\infty,\infty)$

15.The number of integral values of 'x' for which $x^2+19x+92$ is a perfect square, is

a) 0 b) 1 c) 2 d) 3

16.If one root of the equation $x^2+ax+12=0$ is 4, and the equation $x^2-2ax+7b=0$ has real roots, then b lies in the interval

a) (0,7) $(-\infty,7]$ c) (-7,0) d) none of these

17.If $(m^2-3)x^2+3mx+3m+1=0$ has roots which are reciprocals of each other, then the value of m equals to

a) 4 b) -2 c) 2 d) none of these

18.The roots α and β of the quadratic equation $ax^2+bx=C=0$ are real and of opposite sign. Then the roots of the equation $\alpha(x-\beta)^2+\beta(x-\alpha)^2=0$ are

a) positive b) negative c) real and opposite sign d) imaginary

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

a) 3 b) 2 c) 1 d) none of these

20.The equations $ax^2+bx+a=0$, $x^3-2x^2+2x-1=0$ have two roots in common. Then a+b must be equal to

a) 1 b) -1 c) 0 d) none of these

21.The value of 'p' for which the sum of the square of the roots of $2x^2-2(p-2)x-p-1=0$ is least, is

a)1 b) 3/2 c) 2 d) -1

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

a) a>10 b) -15<a<15 c) -10<a<5 d) none of these

23.If sinα, cosα are the roots of equation $cx^2+bx+a=0$, then a,b,c are connected by the relation

a)$b^2+2ac-c^2=0$ b) $c^2+2ac+b^2=0$ c)$b^2-2ac-c^2=0$ d) $2ac-b^2-c^2=0$

24.The of values of 'a' for which 1 lies between the roots of $x^2-ax-a+3=0$ is

a) $(-\infty,-6)$ b) $(-\infty,+6)$ c) $(-\infty,-6)\cup(2,\infty)$ d) $(2,\infty)$

25.The condition that $x^4+ax^3+bx^2+cx+d$ is a perfect square is

a) $c^2=ad$ b) $c^2=ad^2$ c) $c^2=a^2d^2$ d) $c^2=a^2d$

Multiple Choice Questions(Multiple Options Correct)

1.If the equation $x^2+9y^2-4x+3=0$ is satisfied for real values of x and y, then

a) $1\leq x\leq3$ b) $2\leq x\leq3$ c) $-1/3\leq y\leq1/3$ d) $1/3\leq x\leq1$

2.If the roots of the equation $ax^2+bx+c=0$, $a\neq0$, (a,b,c are real numbers), are imaginary and a+c<b, then

a) a+4c<2b b) a+b+c<0 c)4a+c<2b

d) 4a+c<2b if a<0 and 4a+c>2b if a>0

3.The integral values of 'a' for which the equation $\cos^2x-(a^2+a+5)|\cos x|+(a^3+3a^2+2a+6)=0$ has real solution(s)

a) -3 b) -2 c) -1 d)0

COMPREHENSION TYPE

Read the following write up carefully and answer the following questions:

α and β are the roots of the equation $ax^2+bx+c=0$ and α^4,β^4 are the roots of the equation $lx^2+mx+n=0$ (α,β are real and distinct). Let $f(x)=a^2lx^2-4aclx+2c^2l+a^2m=0$, then

1.Roots of f(x) =0 are

a) real and same in sign b) real and opposite in sign

c) equal d) data is insufficient

2.One root of the f(x)=0 is

a) a^2/b^2 b) b^2/a^2 c) b/a d)a/b

3.If $\alpha^3+\beta^3=0$ ($b\neq0$), then

a) a,b,c are in G.P. b) 2a,b,c are in G.P. c) 3a,b,c are in G.P.

d) 4a,b,c are in G.P.

SECTION – II

Multiple Choice Questions (Single Option Correct)

1.Let a,b,c be three distinct positive real numbers, then the number of real roots of $ax^2+2b|x|+c=0$ is

a) 0 b) 1 c) 2 d) 4

2.Let S denote the set of real values of 'a' for which the roots of the equation $x^2-ax-a^2=0$ exceed 'a'. Then S equal to

a) $(-\infty,0)$ b) $(-2,-1/2)$ c) $(-1/2,1/4)$ d) null set

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

a) 2 b) -2 c) 1 d) -1

4.The solution set of $\log_{1/2}(2^{x+2}-4^x)\geq -2$ is

a) $(-\infty,2-\sqrt{13})$ b) $(-\infty,2+\sqrt{13})$ c) $(-\infty,2)$ d) none of these

5.If a,b,c,d be form consecutive terms of an increasing A.P., then the roots of the equation (x – a)(x – c)+2(x – b)(x – d)=0 are

a)Real & distinct b) complex c) equal roots d) none of these

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

a) (-2,0) b) (3,∞) c) (-1,3) d) (1,4)

7.Suppose that f(x) is a quadratic expression positive for all real x. If g(x)= f(x)+f'(x)+f"(x), then for any real x

a) g(x)<0 b) g(x)>0 c) g(x)=0 d) $g(x)\geq0$

8.Number of solutions of the equation $\sin x+\cos x=x^2-2x+\sqrt{35}$ is

a) 0 b)1 c)2 d) infinite

9.The number of integral values of 'a' for which the quadratic equation (x+a)(x+1991)+1=0 has integral roots are

a)3 b)0 c)1 d)2

10.Let a,b,c be real numbers such that a+2b+c=4.Then the max(ab+bc+ca) is equal to

a) 0 b) 1 c) 4 d) -1

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

a) $a\geq4(2)^{1/3}$ b) $a\geq(2)^{1/3}$ c) $a\geq6(2)^{1/3}$ d) $a\geq2(2)^{1/3}$

12.Let $f(x)=ax^2+bx+c$ with f(-1)<1, f(1)> -1, f(3)< -4 and $a\neq0$ then

a) a>0 b) a<1 c) a< -1/8 d) none of these

13.If the roots of the equation $x^2+px+q=0$ differ from the roots of the equation $x^2+qx+p=0$ by the same quantity then

a)p+q+1=0 b)p+q+2=0 c) p+q+4=0 d) none of these

14.If α is a root of the equation $4x^2+2x-1=0$, then other root of the equation is

a) $4\alpha^3-\alpha$ b) $4\alpha^2-3\alpha$ c)$4\alpha^3-3\alpha$ d) $4\alpha^2-\alpha$

15.If one root of the equation $(l-m)x^2+lx+1=0$ is double the other and if l and m are real, then the greatest value of m is

a) 2 b) 9/8 c) 3/2 d) 1