The general form of a quadratic equation in x is, $ax^2 + bx + c = 0$, where $a, b, c \in R$ & $a \neq 0$.

RESULTS:

1. The solution of the quadratic equation,

$$ax^2 + bx + c = 0 \text{ is given by } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

The expression $b^2 - 4ac = D$ is called the discriminant of the quadratic equation.

2. If α & β are the roots of the quadratic equation $ax^2 + bx + c = 0$, then;

(i) $\alpha + \beta = -b/a$ (ii) $\alpha\beta = c/a$

(iii) $\alpha - \beta = \sqrt{D}/a$.

3. NATURE OF ROOTS:

(A) Consider the quadratic equation $ax^2 + bx + c = 0$ where $a, b, c \in R$ & $a \neq 0$ then;

(i) $D > 0 \Leftrightarrow$ roots are real & distinct (unequal).

(ii) $D = 0 \Leftrightarrow$ roots are real & coincident (equal).

(iii) $D < 0 \Leftrightarrow$ roots are imaginary.

(iv) If $p + iq$ is one root of a quadratic equation, then the other must be the conjugate $p - iq$ & vice versa. ($p, q \in R$ & $i = \sqrt{-1}$).

(B) Consider the quadratic equation $ax^2 + bx + c = 0$ where $a, b, c \in Q$ & $a \neq 0$ then;

(i) If $D > 0$ & is a perfect square, then roots are rational & unequal.

(ii) If $\alpha = p + \sqrt{q}$ is one root in this case, (where p is rational & $\sqrt{q}$ is a surd) then the other root must be the conjugate of it i.e. $\beta = p - \sqrt{q}$ & vice versa.

4. A quadratic equation whose roots are α & β is $(x - \alpha)(x - \beta) = 0$ i.e. $x^2 - (\alpha + \beta)x + \alpha\beta = 0$ i.e. $x^2 - (\text{sum of roots})x + \text{product of roots} = 0$.

5. Remember that a quadratic equation cannot have three different roots & if it has, it becomes an identity.

6. Consider the quadratic expression, $y = ax^2 + bx + c$, $a \neq 0$ & $a, b, c \in R$ then;

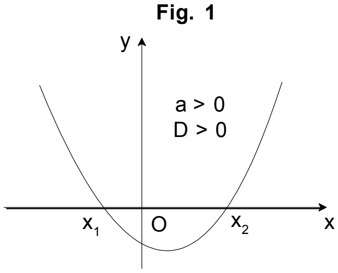
(i) The graph between x, y is always a parabola. If $a > 0$ then the shape of the parabola is concave upwards & if $a < 0$ then the shape of the parabola is concave downwards.

(ii) $\forall\ x \in R$, $y > 0$ only if $a > 0$ & $b^2 - 4ac < 0$ (figure 3).

(iii) $\forall\ x \in R$, $y < 0$ only if $a < 0$ & $b^2 - 4ac < 0$ (figure 6).

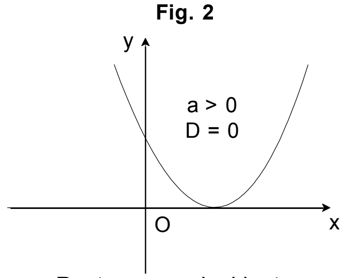
Carefully go through the 6 different shapes of the parabola given below.

Fig. 1



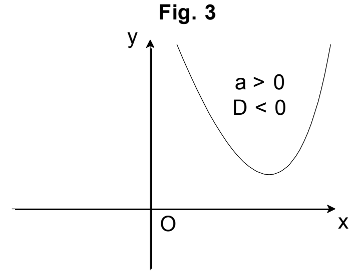
Roots are real & distinct

Fig. 2



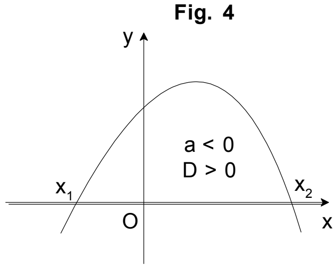
Roots are coincident

Fig. 3



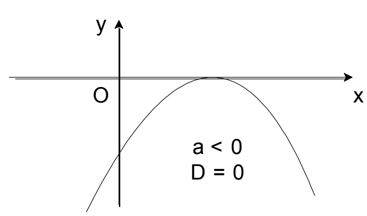
Roots are complex conjugate

Fig. 4



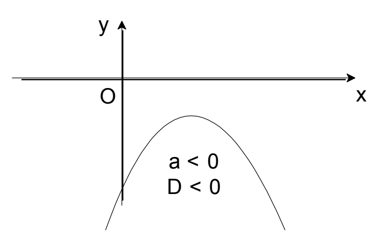
Roots are real & distinct

Fig. 5



Roots are coincident

Fig. 6



Roots are complex conjugate

7. SOLUTION OF QUADRATIC INEQUALITIES:

$ax^2 + bx + c > 0$ $(a \neq 0)$.

(i) If $D > 0$, then the equation $ax^2 + bx + c = 0$ has two different roots $x_1 < x_2$.

Then $a > 0 \Rightarrow x \in (-\infty, x_1) \cup (x_2, \infty)$

$a < 0 \Rightarrow x \in (x_1, x_2)$

(ii) If $D = 0$, then roots are equal, i.e. $x_1 = x_2$. In that case

$a > 0 \Rightarrow x \in (-\infty, x_1) \cup (x_1, \infty)$

$a < 0 \Rightarrow x \in \phi$

(iii) Inequalities of the form $\frac{P(x)}{Q(x)} \lesseqgtr 0$ can be quickly solved using the method of intervals.

8. **Maximum & Minimum Value** of $y = ax^2 + bx + c$ occurs at $x = -(b/2a)$ according as ;

$a < 0$ or $a > 0$. $y \in \left[\frac{4ac - b^2}{4a}, \infty\right)$ if $a > 0$ & $y \in \left(-\infty, \frac{4ac - b^2}{4a}\right]$ if $a < 0$.

9. COMMON ROOTS OF 2 QUADRATIC EQUATIONS [ONLY ONE COMMON ROOT] :

Let α be the common root of $ax^2 + bx + c = 0$ & $a'x^2 + b'x + c' = 0$. Therefore

$a\alpha^2 + b\alpha + c = 0$; $a'\alpha^2 + b'\alpha + c' = 0$. By Cramer's Rule $\frac{\alpha^2}{bc' - b'c} = \frac{\alpha}{a'c - ac'} = \frac{1}{ab' - a'b}$

Therefore, $\alpha = \frac{ca' - c'a}{ab' - a'b} = \frac{bc' - b'c}{a'c - ac'}$.

So the condition for a common root is $(ca' - c'a)^2 = (ab' - a'b)(bc' - b'c)$.

10. The condition that a quadratic function $f(x, y) = ax^2 + 2hxy + by^2 + 2gx + 2fy + c$ may be resolved into two linear factors is that ;

$abc + 2fgh - af^2 - bg^2 - ch^2 = 0$

OR $\begin{vmatrix} a & h & g \\ h & b & f \\ g & f & c \end{vmatrix} = 0$.

11. THEORY OF EQUATIONS :

If $\alpha_1, \alpha_2, \alpha_3, ...\alpha_n$ are the roots of the equation;

$f(x) = a_0x^n + a_1x^{n-1} + a_2x^{n-2} + ... + a_{n-1}x + a_n = 0$ where $a_0, a_1, ... a_n$ are all real & $a_0 \neq 0$ then,

$\sum \alpha_1 = -\frac{a_1}{a_0}$, $\sum \alpha_1\alpha_2 = +\frac{a_2}{a_0}$, $\sum \alpha_1\alpha_2\alpha_3 = -\frac{a_3}{a_0}$, ..., $\alpha_1\alpha_2\alpha_3........\alpha_n = (-1)^n \frac{a_n}{a_0}$

Note :

(i) If α is a root of the equation $f(x) = 0$, then the polynomial $f(x)$ is exactly divisible by $(x - \alpha)$ or $(x - \alpha)$ is a factor of $f(x)$ and conversely .

(ii) Every equation of nth degree $(n \geq 1)$ has exactly n roots & if the equation has more than n roots, it is an identity.

(iii) If the coefficients of the equation $f(x) = 0$ are all real and $\alpha + i\beta$ is its root, then $\alpha - i\beta$ is also a root. i.e. **imaginary roots occur in conjugate pairs**.

(iv) If the coefficients in the equation are all rational & $\alpha + \sqrt{\beta}$ is one of its roots, then $\alpha - \sqrt{\beta}$ is also a root where $\alpha, \beta \in Q$ & β is not a perfect square.

(v) If there be any two real numbers 'a' & 'b' such that f(a) & f(b) are of opposite signs, then $f(x) = 0$ must have atleast one real root between 'a' and 'b' .

(vi) Every equation $f(x) = 0$ of degree odd has atleast one real root of a sign opposite to that of its last term.

12. LOCATION OF ROOTS:

Let $f(x) = ax^2 + bx + c$, where $a > 0$ & $a, b, c \in R$.

(i) Conditions for both the roots of $f(x) = 0$ to be greater than a specified number 'd' are $b^2 - 4ac \geq 0$; $f(d) > 0$ & $(-b/2a) > d$.

(ii) Conditions for both roots of $f(x) = 0$ to lie on either side of the number 'd' (in other words the number 'd' lies between the roots of $f(x) = 0$) is $f(d) < 0$.

(iii) Conditions for exactly one root of $f(x) = 0$ to lie in the interval (d, e) i.e. $d < x < e$ are $b^2 - 4ac > 0$ & $f(d) . f(e) < 0$.

(iv) Conditions that both roots of $f(x) = 0$ to be confined between the numbers p & q are $(p < q)$. $b^2 - 4ac \geq 0$; $f(p) > 0$; $f(q) > 0$ & $p < (-b/2a) < q$.

13. LOGARITHMIC INEQUALITIES

(i) For $a > 1$ the inequality $0 < x < y$ & $\log_a x < \log_a y$ are equivalent.

(ii) For $0 < a < 1$ the inequality $0 < x < y$ & $\log_a x > \log_a y$ are equivalent.

(iii) If $a > 1$ then $\log_a x < p \Rightarrow 0 < x < a^p$

(iv) If $a > 1$ then $\log_a x > p \Rightarrow x > a^p$

(v) If $0 < a < 1$ then $\log_a x < p \Rightarrow x > a^p$

(vi) If $0 < a < 1$ then $\log_a x > p \Rightarrow 0 < x < a^p$

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

(A) 3 (B) 0

(C) 1 (D) 2

2. The roots of the equation

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

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

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

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

(A) 0, 1 (B) –1, 1

(C) 0, –1 (D) –1, 2

4. If the roots of the equation $x^2 + 2ax + b = 0$ are real and distinct and they differ by at most 2m, then b lies in the interval

(A) $(a^2 - m^2, a^2)$ (B) $[a^2 - m^2, a^2)$

(C) $(a^2, a^2 + m^2)$ (D) None of these

5. The value of a for which the sum of the squares of the roots of the equation $x^2 - (a - 2)x - a - 1 = 0$ assume the least value is

(A) 2 (B) 3

(C) 0 (D) 1

6. Let $a > 0$, $b > 0$ and $c > 0$. Then both the roots of the equation $ax^2 + bx + c = 0$

(A) are real and negative

(B) have negative real parts

(C) are rational numbers

(D) have positive real parts

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

(A) q + r (B) q – r

(C) – (q + r) (D) –(p + q + r)

8. Let a, b and c are real numbers such that $4a + 2b + c = 0$ and $ab > 0$. Then the equation $ax^2 + bx + c = 0$ has

(A) real roots (B) imaginary roots

(C) exactly one root (D) None of these

9. The expression $y = ax^2 + bx + c$ has always the same sign as of 'a' if

(A) $4ac < b^2$ (B) $4ac > b^2$

(C) $ac < b^2$ (D) $ac > b^2$

10. 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 sig

11. If both roots of the quadratic equation $(2 - x)(x + 1) = p$ are distinct & positive, then p must lie in the interval

(A) $(2, \infty)$ (B) (2, 9/4)

(C) $(-\infty-2)$ (D) $(-\infty,\infty)$

12. If the equation $k(6x^2 + 3) + rx + 2x^2 - 1 = 0$ and $6k(2x^2 + 1) + px + 4x^2 - 2 = 0$ have both roots common, then the value of $(2r - p)$ is

(A) 0 (B) 1/2

(C) 1 (D) None of these

13. If the quadratic equations $3x^2 + ax + 1 = 0$ and $2x^2 + bx + 1 = 0$ have a common root, then the value of the expression $5ab - 2a^2 - 3b^2$ is

(A) 0 (B) 1

(C) –1 (D) None of these

14. The equations $x^3 + 5x^2 + px + q = 0$ and $x^3 + 7x^2 + px + r = 0$ have tworoots in common. If the third root of each equation is represented by x_1 and x_2 respectivley, then the ordered pair (x_1, x_2) is

(A) (–5, –7) (B) (1, –1)

(C) (–1, 1) (D) (5, 7)

15. If $\alpha, \beta, \gamma, \delta$ are the roots of the equation $x^4 - Kx^3 + Kx^2 + Lx + M = 0$, where K, L & M are real numbers, then the minimum value of $\alpha^2 + \beta^2 + \gamma^2 + \delta^2$ is

(A) 0 (B) –1

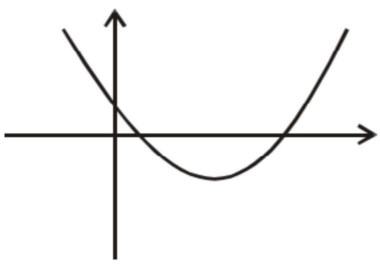
(C) 1 (D) 2

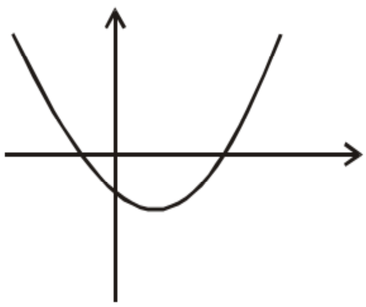
16. If $\frac{6x^2 - 5x - 3}{x^2 - 2x + 6} \leq 4$, then least and the highest values of $4x^2$ are

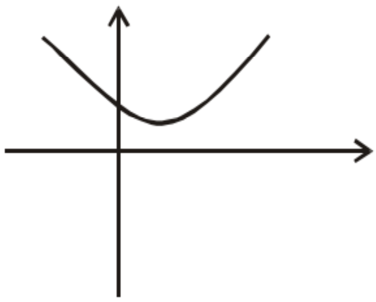
(A) 0 & 81 (B) 9 & 81

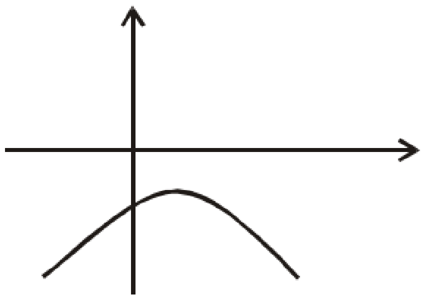
(C) 36 & 81 (D) None of these

17. Which of the following graph represents expression $f(x) = ax^2 + bx + c$ $(a \neq 0)$ when $a > 0$, $b < 0$ & $c < 0$?

(A) 

(B)


(C)


(D)


18. The entire graph of the expression $y = x^2 + kx - x + 9$ is strictly above the x–axis if and only if
(A) $k < 7$ (B) $-5 < k < 7$
(C) $k > -5$ (D) None of these

19. If α, β are the roots of the quadratic equation $x^2 - 2p(x - 4) - 15 = 0$, then the set of values of p for which one roots is less than 1 & the other root is greater than 2 is
(A) $(7/3, \infty)$ (B) $(-\infty, 7/3)$
(C) $x \in R$ (D) None of these

20. If α, β be the roots of $4x^2 - 16x + \lambda = 0$, where $\lambda \in R$ such that $1 < \alpha < 2$ and $2 < \beta < 3$, then the number of integral solutions of λ is
(A) 5 (B) 6
(C) 2 (D) 3

21. Number of values 'p' for which the equation $(p^2 - 3p + 2)x^2 - (p^2 - 5p + 4)x + p - p^2 = 0$ possess more than two roots, is
(A) 0 (B) 1
(C) 2 (D) None of these

22. If product of roots of the equation $mx^2 + 6x + (2m - 1) = 0$ is – 1, then m equals
(A) – 1 (B) 1
(C) 1/3 (D) – 1/3

23. If α , β are roots of the equation $2x^2 - 35x + 2 = 0$, then the value of$(2\alpha - 35)^3 . (2\beta - 35)^3$ is equal to-
(A) 1 (B) 8
(C) 64 (D) None of these

24. Let α, β, γ be the roots of $(x - a)(x - b)(x - c) = d$, $d \neq 0$ then the roots of the eduation $(x - \alpha)(x - \beta)(x - \gamma) + d = 0$ are
(A) a + 1, b + 1, c + 1 (B) a, b, c
(C) 1 – 1, b – 1, c – 1 (D) $\frac{a}{b}, \frac{b}{c}, \frac{c}{a}$

25. Consider the equation $x^2 + 2x - n = 0$, where $n \in N$ and $n \in [5, 100]$. Total number of different values of 'n' so that the given equation has integral roots, is
(A) 4 (B) 6
(C) 8 (D) 3

26. If roots of the equation
$ax^2 + 2(a + b)x + (a + 2b + c) = 0$ are imaginary, then roots of the equation
$ax^2 + 2bx + c = 0$ are -
(A) rational (B) irrational
(C) equal (D) complex

27. Roots of the equation
$(a + b - c)x^2 - 2ax + (a - b + c) = 0$, $(a,b,c \in Q)$ are
(A) rational (B) irrational
(C) complex (D) None of these

28. If coefficients of the equation $ax^2 + bx + c = 0$, $a \neq 0$ are real and roots of the equation are non– real complex and $a + c + b < 0$, then
(A) $4a + c > 2b$ (B) $4a + c < 2b$
(C) $4a + c = 2b$ (D) None of these

29. If one of the factors of $ax^2 + bx + c$ and $bx^2 + cx + a$ is common, then-
(A) a = 0
(B) $a^3 + b^3 + c^3 = 3abc$
(C) a = 0 or $a^3 + b^3 + c^3 = 3abc$
(D) None of these

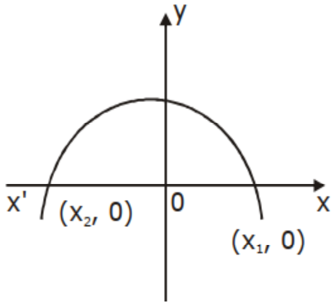
30. The condition for $a^2x^4 + bx^3 + cx^2 + dx + f^2$ may be perfect square is
(A) $2a^2c = a^3f$ (B) $4a^2c - b^2 = 8a^3f$
(C) $4a^3c = 8a^3f$ (D) None of these

31. If $y = -2x^2 - 6x + 9$, then
(A) maximum value of y is –11 and it occurs at x = 2
(B) minimum value of y is –11 and it occurs at x = 2
(C) maximum value of y is 13.5 and it occurs at x = –1.5
(D) minimum value of y is 13.5 and it occurs atx = –1.5

32. Consider $y = \frac{2x}{1+x^2}$, where x is real, then the range of expression $y^2 + y - 2$ is

(A) $[-1, 1]$ (B) $[0, 1]$
(C) $[-9/4, 0]$ (D) $[-9/4, 1]$

33. The diagram shows the graph of $y = ax^2 + bx + c$. Then -



(A) $a > 0$ (B) $b^2 - 4ac < 0$
(C) $c > 0$ (D) $b^2 - 4ac = 0$

34. Let a, b, c be real, if $ax^2 + bx + c = 0$ has two real roots α and β, where $\alpha < -2$ and $\beta > 2$, then

(A) $4+\frac{2b}{a}+\frac{c}{a}=0$ (B) $4-\frac{2b}{a}+\frac{c}{a}=0$

(C) $4+\frac{2b}{a}-\frac{c}{a}<0$ (D) $4-\frac{2b}{a}+\frac{c}{a}<0$

35. If both roots of the quadratic equation $x^2 + x + p = 0$ exceed p, where $p \in R$, then p must lie in the interval

(A) $(-\infty, 1)$ (B) $(-\infty, -2)$
(C) $(-\infty, -2) \cup (0, 1/4)$ (D) $(-2, 1)$

36. If $a^2 + b^2 + c^2 = 1$, then $ab + bc + ca$ lies in the interval

(A) $\left[\frac{1}{2}, 2\right]$ (B) $[-1, 2]$

(C) $\left[-\frac{1}{2}, 1\right]$ (D) $\left[-1, \frac{1}{2}\right]$

37. The quadratic equations $x^2 - 6x + a = 0$ and $x^2 - cx + 6 = 0$ have one root in common. The other roots of the first and second equations are integers in the ratio 4 : 3. Then the common root is [AIEEE-2008]

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

38. If α and β are the roots of the equation $x^2 - x + 1 = 0$, then $\alpha^{2009} + \beta^{2009} =$ [AIEEE - 2010]

(A) -2 (B) -1
(C) 1 (D) 2

39. Let α and β be the roots of equation $px^2 + qx + r = 0$, $p \neq 0$. If p, q, r are in A.P. and $\frac{1}{\alpha}+\frac{1}{\beta}=4$ then the value of $|\alpha - \beta|$ is [AIEEE - 2014]

(A) $\frac{\sqrt{61}}{9}$ (B) $\frac{2\sqrt{17}}{9}$

(C) $\frac{\sqrt{34}}{9}$ (D) $\frac{2\sqrt{13}}{9}$

40. Let α and β be the roots of equation $x^2 - 6x - 2 = 0$. If $a_n = \alpha^n - \beta^n$, then the value of $\frac{a_{10} - 2a_8}{2a_9}$ is equal to : [AIEEE -2015]

(A) 3 (B) -3
(C) 6 (D) -6

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

(A) $a + b + c$ & $a - b + c$
(B) $1/2$ & $a - 2b + c$
(C) $a - 2b + c$ & $1/(a + b - 2c)$
(D) none of these

42. If the A.M. of the roots of a quadratic equation is $\frac{8}{5}$ and A.M. of their reciprocals is $\frac{8}{7}$, then the quadratic equation is -

(A) $5x^2 - 8x + 7 = 0$ (B) $5x^2 - 16x + 7 = 0$ (C) $7x^2 - 16x + 5 = 0$ (D) $7x^2 + 16x + 5 = 0$

43. A quadratic equation with rational coefficients one of whose roots is $\tan\left(\frac{\pi}{12}\right)$ is -

(A) $x^2 - 2x + 1 = 0$ (B) $x^2 - 2x + 4 = 0$ (C) $x^2 - 4x + 1 = 0$ (D) $x^2 - 4x - 1 = 0$

44. If x, y are rational number such that $x + y + (x - 2y)\sqrt{2} = 2x - y + (x - y - 1)\sqrt{6}$, then

(A) x and y connot be determined
(B) $x = 2, y = 1$
(C) $x = 5, y = 1$
(D) none of these

45. The smallest integer x for which the inequality $\frac{x-5}{x^2+5x-14} > 0$ is satisfied is given by -

(A) -7 (B) -5
(C) -4 (D) -6

46. The number of positive integral solutions of the inequation $\frac{x^2(3x-4)^3\ (x-2)^4}{(x-5)^5\ (2x-7)^6} \le 0$ is -

(A) 2 (B) 0
(C) 3 (D) 4

47. The expression $\frac{x^2+2x+1}{x^2+2x+7}$ lies in the interval ; $(x \in R)$ -

(A) $[0, -1]$ (B) $(-\infty, 0] \cup [1, \infty)$
(C) $[0, 1)$ (D) none of these

48. If the roots of the equation $x^2 - 2ax + a^2 + a - 3 = 0$ are real & less than 3 then -

(A) $a < 2$ (B) $2 \le a \le 3$
(C) $3 < a \le 4$ (D) $a > 4$

49. The number of integral values of m, for which the roots of $x^2 - 2mx + m^2 - 1 = 0$ will lie between -2 and 4 is -

(A) 2 (B) 0
(C) 3 (D) 1

50. If the roots of the equation, $x^3 + Px^2 + Qx - 19 = 0$ are each one more than the roots of the equation, $x^3 - Ax^2 + Bx - C = 0$, where A, B, C, P & Q are constants then the value of A + B + C =

(A) 18 (B) 19
(C) 20 (D) none

51. Number of real solutions of the equation $x^4 + 8x^2 + 16 = 4x^2 - 12x + 9$ is equal to -

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

(One question multiple - 52)

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

(A) $p + q = r$
(B) $p + q = 2r$
(C) product of roots $= -\frac{1}{2}(p^2 + q^2)$
(D) sum of roots = 1

53. If a, b, c are real distinct numbers satisfying the condition $a + b + c = 0$ then the roots of the quadratic equation $3ax^2 + 5bx + 7c = 0$ are -

(A) positive
(B) negative
(C) real and distinct
(D) imaginary

54. If $x^2 + Px + 1$ is a factor of the expression $ax^3 + bx + c$ then -

(A) $a^2 + c^2 = -ab$ (B) $a^2 - c^2 = -ab$
(C) $a^2 - c^2 = ab$ (D) none of these

55. The set of values of 'a' for which the inequality $(x - 3a)(x - a - 3) < 0$ is satisfied for all x in the interval $1 \le x \le 3$

(A) (1/3, 3) (B) (0, 1/3)
(C) (–2, 0) (D) (–2, 3)

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

(A) 2 (B) – 3
(C) – 6 (D) 1

57. If p & q are distinct reals, then $2\{(x-p)(x-q) + (p-x)(p-q) + (q-x)(q-p)\} = (p-q)^2 + (x-p)^2 + (x-q)^2$ is satisfied by -

(A) no value of x
(B) exactly one value of x
(C) exactly two values of x
(D) infinite values of x

58. The value of 'a' for which the expression $y = x^2 + 2a\sqrt{a^2-3}\,x + 4$ is perfect square, is -

(A) 4
(B) $\pm\sqrt{3}$
(C) ± 2
(D) $a \in (-\infty, -\sqrt{3}\,] \cup [\,\sqrt{3}, \infty)$

59. Set of values of 'K' for which roots of the quadratic $x^2 - (2K - 1)x + K(K - 1) = 0$ are -

(A) both less than 2 is $K \in (2, \infty)$
(B) of opposite sign is $K \in (-\infty, 0) \cup (1, \infty)$
(C) of same sign is $K \in (-\infty, 0) \cup (1, \infty)$
(D) both greater than 2 is $K \in (2, \infty)$

(One question multiple -60)

60. If $\alpha_1 < \alpha_2 < \alpha_3 < \alpha_4 < \alpha_5 < \alpha_6$, then the equation $(x-\alpha_1)(x-\alpha_3)(x-\alpha_5) + 3(x-\alpha_2)(x-\alpha_4)(x-\alpha_6) = 0$ has -

(A) three real roots
(B) no real root in $(-\infty, \alpha_1)$
(C) one real root in (α_1, α_2)
(D) no real root in (α_5, α_6)

61. The value(s) of 'b' for which the equation, $2\log_{1/25}(bx + 28) = -\log_5(12 - 4x - x^2)$ has coincident roots, is/are -

(A) b = –12
(B) b = 4
(C) b = 4 or b = –12
(D) b = –4 or b = 12

62. For every $x \in R$, the polynomial $x^8 - x^5 + x^2 - x + 1$ is -

(A) positive
(B) never positive
(C) positive as well as negative
(D) negative

1. A	**2.** B	**3.** C	**4.** B	**5.** D	**6.** B	**7.** C	**8.** A	**9.** B	**10.** A	**11.** B	**12.** A	**13.** B
14. A	**15.** B	**16.** A	**17.** B	**18.** B	**19.** B	**20.** D	**21.** B	**22.** C	**23.** C	**24.** B	**25.** C	**26.** D
27. A	**28.** B	**29.** C	**30.** B	**31.** C	**32.** C	**33.** C	**34.** D	**35.** B	**36.** C	**37.** C	**38.** C	**39.** D
40. A	**41.** D	**42.** B	**43.** C	**44.** B	**45.** D	**46.** C	**47.** C	**48.** A	**49.** C	**50.** A	**51.** A	**52.** BC
53. C	**54.** C	**55.** B	**56.** B	**57.** D	**58.** C	**59.** C	**60.** ABC	**61.** B	**62.** A			