EXERCISE – 4 (FOR OLYMPIADS)

Choose The Correct One

1. If α, β and γ are the zeros of the polynomial $2x^3 - 6x^2 - 4x + 30$. then the value of $(\alpha\beta + \beta\gamma + \gamma\alpha)$ is
(A) -2 (B) 2 (C) 5 (D) -30

2. If α, β and γ are the zeros of the polynomial $f(x) = ax^3 + bx^2 + cx + d$, then $\frac{1}{\alpha}+\frac{1}{\beta}+\frac{1}{\gamma}=$
(A) $-\frac{b}{a}$ (B) $\frac{c}{d}$ (C) $-\frac{c}{d}$ (D) $-\frac{c}{a}$

3. If α, β and γ are the zeros of the polynomial $f(x) = ax^3 - bx^2 + cx - d$, then $\alpha^2 + \beta^2 + \gamma^2 =$
(A) $\frac{b^2 - ac}{a^2}$ (B) $\frac{b^2 + 2ac}{b^2}$ (C) $\frac{b^2 - 2ac}{a}$ (D) $\frac{b^2 - 2ac}{a^2}$

4. If α, β and γ are the zeros of the polynomial $f(x) = x^3 + px^2 - pqrx + r$, then $\frac{1}{\alpha\beta}+\frac{1}{\beta\gamma}+\frac{1}{\gamma\alpha}=$
(A) $\frac{r}{p}$ (B) $\frac{p}{r}$ (C) $-\frac{p}{r}$ (D) $-\frac{r}{p}$

5. If the parabola $f(x) = ax^2 + bx + c$ passes through the points (-1, 12), (0, 5) and (2, -3) , the value of a + b + c is –
(A) - 4 (B) -2 (C) Zero (D) 1

6. If a, b are the zeros of $f(x) = x^2 + px + 1$ and c, d are the zeros of $f(x) = x^2 + qx + 1$ the value of $E = (a - c)(b - c)(a + b)(b + d)$ is –
(A) $p^2 - q^2$ (B) $q^2 - p^2$ (C) $q^2 + p^2$ (D) None of these

7. If α, β are zeros of $ax^2 + bx + c$ then zeros of $a^3x^2 + abcx + c^3$ are -
(A) $\alpha\beta, \alpha + \beta$ (B) $\alpha^2\beta, \alpha\beta^2$ (C) $\alpha\beta, \alpha^2\beta^2$ (D) α^3, β^3

8. Let α, β be the zeros of the polynomial $x^2 - px + r$ and $\frac{\alpha}{2}, 2\beta$ be the zeros of $x^2 - qx + r$, Then the value of r is –
(A) $\frac{2}{9}(p-q)(2q-p)$ (B) $\frac{2}{9}(q-p)(2p-q)$ (C) $\frac{2}{9}(q-2)(2q-p)$ (D) $\frac{2}{9}(2p-q)(2q-p)$

9. When $x^{200} + 1$ is divided by $x^2 + 1$, the remainder is equal to –
(A) x + 2 (B) 2x – 1 (C) 2 (D) - 1

10. If $a(p+q)^2 + 2bpq + c = 0$ and also $a(q + r)^2 + 2bqr + c = 0$ then pr is equal to –
(A) $p^2 + \frac{a}{c}$ (B) $q^2 + \frac{c}{a}$ (C) $p^2 + \frac{a}{b}$ (D) $q^2 + \frac{a}{c}$

11. If a, b and c are not all equal and α and β be the zeros of the polynomial $ax^2 + bx + c$, then value of $(1+\alpha+\alpha^2)(1+\beta+\beta^2)$ is :
(A) 0 (B) positive (C) negative (D) non-negative

12. Two complex number α and β are such that $\alpha + \beta = 2$ and $\alpha^4 + \beta^4 = 272$, then the polynomial whose zeros are α and β is –
(A) $x^2 - 2x - 16 = 0$ (B) $x^2 - 2x + 12 = 0$ (C) $x^2 - 2x - 8 = 0$ (D) None of theses

13. If 2 and 3 are the zeros of $f(x) = 2x^3 + mx^2 - 13x + n$, then the values of m and n are respectively –
(A) -5 , - 30 (B) -5, 30 (C) 5, 30 (D) 5, -30

14. If α, β are the zeros of the polynomial $6x^2 + 6px + p^2$, then the polynomial whose zeros are $(\alpha + \beta)^2$ and $(\alpha - \beta)^2$ is –

(A) $3x^2 + 4p^2x + p^4$ (B) $3x^2 + 4p^2x - p^4$
(C) $3x^2 - 4p^2x + p4$ (D) None of theses

15. If c, d are zeros of $x^2 - 10ax - 11b$ and a, b are zeros of $x^2 - 10cx - 11d$, then value of a + b + c + d is –

(A) 1210 (B) -1 (C) 2530 (D) -11

16. If the ratio of the roots of polynomial $x^2 + bx + c$ is the same as that of the ratio of the roots of $x^2 + qx + r$, then –

(A) $br^2 = qc^2$ (B) $cq^2 = rb^2$ (C) $q^2c^2 = b^2r^2$ (D) bq = rc

17. The value of p for which the sum of the squares of the roots of the polynomial $x^2 - (p - 2)x - p - 1$ assume the least value is -

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

18. If the roots of the polynomial $ax^2 + bx + c$ are of the form $\frac{\alpha}{\alpha - 1}$ and $\frac{\alpha + 1}{\alpha}$ then the value of $(a + b + c)^2$ is-

(A) $b^2 - 2ac$ (B) $b^2 - 4ac$ (C) $2b^2 - ac$ (D) $4b^2 - 2ac$

19. If α, β and γ are the zeros of the polynomial $x^3 + a_0x^2 + a_1x + a_2$, then $(1 - \alpha^2)(1 - \beta^2)(1 - \gamma)$ is

(A) $(1 - a_1)^2 + (a_0 - a_2)^2$ (B) $(1 + a_1)^2 - (a_0 + a_2)^2$ (C) $(1 + a_1)^2 + (a_0 + a_2)^2$ (D) None of these

20. If α, β, γ are the zeros of the polynomial $x^3 - 3x + 11$, then the polynomial whose zeros are $(\alpha + \beta)(\beta + \gamma)$ and $(\gamma + \beta)$ is –

(A) $x^3 + 3x + 11$ (B) $x^3 - 3x + 11$ (C) $x^3 + 3x - 11$ (D) $x^3 - 3x - 11$

21. If α, β, γ are such that $\alpha + \beta + \gamma = 2,\ \alpha^2 + \gamma^2 = 6,\ \alpha^3 + \beta^3 + \gamma^3 = 8,$ then $\alpha^4 + \beta^4 + \gamma^4$ is equal to –

(A) 10 (B) 12 (C) 18 (D) None of these

22. If α, β are the roots of $ax^2 + bx + c$ and $\alpha + k,\ \beta + k$ are the roots of $px^2 + qx + r$, then k =

(A) $-\frac{1}{2}\left[\frac{a}{b} - \frac{p}{q}\right]$ (B) $\left[\frac{a}{b} - \frac{p}{q}\right]$ (C) $\frac{1}{2}\left[\frac{b}{a} - \frac{q}{p}\right]$ (D) (ab – pq)

23. If α, β are the roots of the polynomial $x^2 - px + q$, then the quadratic polynomial, the roots of which are $(\alpha^2 - \beta^2)(\alpha^3 - \beta^3)$ and $\alpha^3\beta^2 + \alpha^2\beta^3$:

(A) $px^2 - (5p + 7q)x - (p^6q^6 + 4p^2q^6) = 0$ (B) $x^2 - (p^5 - 5p^3q + 5pq^2)x + (p^6q^2 - 5p^4q^3 + 4p^2q^4) = 0$
(C) $x^2 - (p^3q - 5p^5 + p^4q) - (p^6q^2 - 5p^2q^6) = 0$ (D) All of the above

24. The condition that $x^3 - ax^2 + bx - c = 0$ may have two of the roots equal to each other but of opposite signs is :

(A) ab = c (B) $\frac{2}{3}a = bc$ (C) $a^2b = c$ (D) None of these

25. If the roots of polynomial $x^2 + bx + ac$ are α, β and roots of the polynomial $x^2 + ax + bc$ are α, γ then the values of α, β, γ respectively are –

(A) a,b,c (B) b,c,a (C) c,a,b (D) None of these

26. If one zero of the polynomial $ax^2 + bx + c$ is positive and the other negative then (a, b, c $\in$ R, a $\neq$ 0)

(A) a and b are of opposite signs. (B) a and c are of opposite signs.
(C) b and c are of opposite signs. (D) a,b,c are all of the same sign.

27. If α, β are the zeros of the polynomial $x^2 - px + q$. then $\frac{\alpha^2}{\beta^2} + \frac{\beta^2}{\alpha^2}$ is equal to -

(A) $\frac{p^4}{q^2} + 2 - \frac{4p^2}{q}$ (B) $\frac{p^4}{q^2} - 2 + \frac{4p^2}{q}$ (C) $\frac{p^4}{q^2} + 2q - \frac{4p^2}{q}$ (D) None of these

28. If α, β are the zeros of the polynomial $x^2 - px + 36$ and $\alpha^2 + \beta^2 = 9$, then p =

(A) ± 6 (B) $\pm$ 3 (C) $\pm$ 8 (D) ± 9

29. If α, β are zeros of $ax^2 + bx + c$, $ac \neq 0$, then zeros of $cx^2 + bx + a$ are –

(A) $-\alpha, \ -\beta$ (B) $\alpha, \frac{1}{\beta}$ (C) $\beta, \frac{1}{\alpha}$ (D) $\frac{1}{\alpha}, \frac{1}{\beta}$

30. A real number is said to be algebraic if it satisfies a polynomial equation with integral coefficients. Which of the following numbers is not algebraic :

(A) $\frac{2}{3}$ (B) $\sqrt{2}$ (C) 0 (D) π

31. The bi-quadratic polynomial whose zeros are 1, 2, $\frac{4}{3}, -1$ is :

(A) $3x^4 - 10x^3 + 5x^2 + 10x - 8$ (B) $3x^4 + 10x^3 - 5x^2 + 10x - 8$
(C) $3x^4 + 10x^3 + 5x^2 - 10x - 8$ (D) $3x^4 - 10x^3 - 5x^2 + 10x - 8$

32. The cubic polynomials whose zeros are $4, \frac{3}{2}$ and -2 is :

(A) $2x^3 + 7x^2 + 10x - 24$ (B) $2x^3 + 7x^2 - 10x - 24$
(C) $2x^3 - 7x^2 - 10x + 24$ (D) None of these

33. If the sum of zeros of the polynomial $p(x) = kx^3 - 5x^2 - 11x - 3$ is 2, then k is equal to :

(A) $k = -\frac{5}{2}$ (B) $k = \frac{2}{5}$ (C) k = 10 (D) $k = \frac{5}{2}$

34. If $f(x) = 4x^3 - 6x^2 + 5x - 1$ and α, β and γ are its zeros , then $\alpha\beta\gamma =$

(A) $\frac{3}{2}$ (B) $\frac{5}{4}$ (C) $-\frac{3}{2}$ (D) $\frac{1}{4}$

35. Consider $f(x) = 8x^4 - 2x^2 + 6x - 5$ and $\alpha, \beta, \gamma.\delta$ are it's zeros then $\alpha + \beta + \gamma + \delta =$

(A) $\frac{1}{4}$ (B) $-\frac{1}{4}$ (C) $-\frac{3}{2}$ (D) None of these

36. If $x^2 - ax + b = 0$ and $x^2 = px + q = 0$ have a root in common and the second equation has equal roots, then –

(A) b + q = 2ap (B) $b + q = \frac{ap}{2}$ (C) b + q = ap (D) None of these

OBJECTIVE					ANSWER KEY						EXERCISE - 4				
Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	A	C	D	B	C	B	B	D	C	B	D	C	B	C	A
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	B	B	B	B	D	C	C	B	A	C	B	A	D	D	D
Que.	31	32	33	34	35	36									
Ans.	A	C	D	D	D	B									

EXERCISE - 5 (FOR IIT-JEE/AIEEE)

Choose The Correct One

1. If the sum of the two zeros of $x^3 + px^2 + qx + r$ is zero, then pq = **[EAMCET - 2003]**

(A) $-r$ (B) r (C) 2r (D) $-2r$

2. Let $a \neq 0$ and p(x) be a polynomial of degree grater than 2. If p(x) leaves remainders a and – a when divided respectively by x + a and x – a , the remainder when p(x) is divided by $x^2 - a^2$ is **[EAMCET - 2003]**

(A) 2x (B) – 2x (C) x (D) – x

3. If one root of the polynomial $x^2 + px + q$ is square of the other root, then **[IIT-Screening - 2003]**

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

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

4. If α, β are the zeros of $x^2 + px + 1$ and γ, δ be those of $x^2 + qx + 1$, then the value of $(\alpha - \gamma)(\beta - \gamma)(\alpha + \delta)(\beta + \delta) =$ **[DCE-2000]**

(A) $p^2 - q^2$ (B) $q^2 - p^2$ (C) p^2 (D) q^2

5. The quadratic polynomial whose zeros are twice the zeros of $2x^2 - 5x + 2 = 0$ is – **[Kerala Engineering -2003]**

(A) $8x^2 - 10x + 2$ (B) $x^2 - 5x + 4$ (C) $2x^2 - 5x + 2$ (D) $x^2 - 10x + 6$

6. The coefficient of x in $x^2 + px + q$ was taken as 17 in place of 13 and it's zeros were found to be – 2 and – 15. The zeros of the original polynomial are - **[Kerala Engineering -2003]**

(A) 3, 7 (B) – 3 , 7 (C) – 3 , – 7 (D) – 3, – 10

7. If $\alpha + \beta = 4$ and $\alpha^2 + \beta^2 = 44$, then α, β are the zeros of the polynomial . **[Kerala Engineering -2003]**

(A) $2x^2 - 7x + 6$ (B) $3x^2 + 9x + 11$ (C) $9x^2 - 27x + 20$ (D) $3x^2 - 12x + 5$

8. If α, β, γ are the zeros of the polynomial $x^3 + 4x + 1$, then $(\alpha + \beta)^{-1} + (\beta + \gamma)^{-1} + (\gamma + \alpha)^{-1} =$

(A) 2 (B) 3 (C) 4 (D) 5 **[EAMCET-2003]**

9. If α, β are the zeros of the quadratic polynomial $4x^2 - 4x + 1$, then $\alpha^3 + \beta^3$ is –

(A) $\frac{1}{4}$ (B) $\frac{1}{8}$ (C) 16 (D) 32

10. The value of 'a', for which one root of the quadratic polynomial $(a^2 - 5a + 3)x^2 + (3a - 1)x + 2$ is twice as large as the other, is - **[AIEEE -2003]**

(A) $-\frac{1}{3}$ (B) $\frac{2}{3}$ (C) $-\frac{2}{3}$ (D) $\frac{1}{3}$

11. Let α, β be the zeros of $x^2 + (2 - \lambda)x - \lambda$. The values of λ for which $\alpha^2 + \beta^2$ is minimum is –

(A) 0 (B) 1 (C) 2 (D) 3 **[AMU-2002]**

12. If 1 + 2i is a zero of the polynomial $x^2 + bx + c$, $b, c \in R$, then (b, c) is given by –

(A) (2. – 5) (B) (- 3, 1) (C) (-2, 5) (D) (3, 1)

13. If 2 + i is a zero of the polynomial $x^3 - 5x^2 + 9x - 5$, the other zeros are –

(A) 1 and 2 – i (B) – 1 and 3 + i (C) 0 and 1 (D) None of these

14. The value of λ for which one zero of $3x^2 - (1 + 4\lambda)x + \lambda^2 + 2$ may be one-third of the other is –

(A) 4 (B) $\frac{33}{8}$ (C) $\frac{17}{4}$ (D) $\frac{31}{8}$

15. If 1 – i is a zero of the polynomial $x^2 + ax + b$, then the values of a and b are respectively .

(A) 2, 1 (B) – 2 , 2 (C) 2, 2 (D) 2, - 2 **[Tamil Nadu Engineering 2002]**

16. If the sum of the zeros of the polynomial $x^2 + px + q$ is equal to the sum of their squares, then –

(A) $P^2 - q^2 = 0$ (B) $p^2 + q^2 = 0$ (C) $p^2 + p = 2q$ (D) None of these

17. Let α, β be the zeros of the polynomial (x – a) (x – b) – c with $c \neq 0$. then the zeros of the polynomial $(x-\alpha)(x-\beta)$ + c are : **[IIT-1992, AIEEE - 2002]**

(A) a, c (B) b, c (C) a, b (D) a + c, b + c

18. If p, q are zeros of $x^2 + px + q$. then **[AIEEE - 2002]**

(A) p = 1 (B) p = 1 or 0 (C) p = - 2 (D) p = - 2 or 0

19. If $\alpha \neq \beta$ and $\alpha^2 = 5\alpha - 3, \beta^2 = 5\beta - 3$, then the polynomial whose zeros are $\frac{\alpha}{\beta}$ and $\frac{\beta}{\alpha}$ is : **[AIEEE - 2002]**

(A) $3x^2 - 25x + 3$ (B) $x^2 - 5x + 3$ (C) x2+5x – 3 (D) $3x^2 - 19x + 3$

20. If $\alpha \neq \beta$ and the difference between the roots of the polynomials $x^2 + ax + b$ and $x^2 + bx + a$ is the same, then **[AIEEE - 2002]**

(A) a + b + 4 = 0 (B) a + b – 4 = 0 (C) a – b + 4 = 0 (D) a – b – 4 = 0

21. If the zeros of the polynomial $ax^2 + bx + c$ be in the ratio m : n, then

(A) $b^2 mn = (m^2 + n^2) ac$ (B) $(m + n)^2 ac = b^2 mn$

(C) $b^2 (m^2 + n^2) = mnac$ (D) None of these

COMPREHENSION BASED QUESTIONS

Maximum and Minimum value of a quadratic expression :

At $x = \frac{-b}{2a}$, we get the maximum or minimum value of the quadratic expression, $y = ax^2 + bx + c$

(i) When a > 0, the expression $ax^2 + bx + c$ gives minimum value $= \frac{4ac - b^2}{4a}$

(ii) When a < 0, the expression $ax^2 + bx + c$ gives maximum value $= \frac{4ac - b^2}{4a}$

Based on above information, do the following questions :

22. The minimum value of the expression $4x^2 + 2x + 1$ $(x \in R)$ is -

(A) $\frac{1}{4}$ (B) $\frac{1}{2}$ (C) $\frac{3}{4}$ (D) 1

23. If x be real , the maximum value of $7 + 10x - 5x^2$ is –

(A) 12 (B) 15 (C) 16 (D) 18

24. If p and q $(\neq 0)$ are the zeros of the polynomial $x^2 + px + q$, then the least value of $x^2 + px + q$ $(x \in R)$ is –

(A) $-\frac{1}{4}$ (B) $\frac{1}{4}$ (C) $-\frac{9}{4}$ (D) $\frac{9}{4}$

25. If x is real, the minimum value of $x^2 - 8x + 17$ is –

(A) – 1 (B) 0 (C) 1 (D) 2

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Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	B	D	A	B	B	D	D	C	A	B	B	C	A	D	B
Que.	16	17	18	19	20	21	22	23	24	25					
Ans.	C	C	B	D	A	B	C	A	C	C					