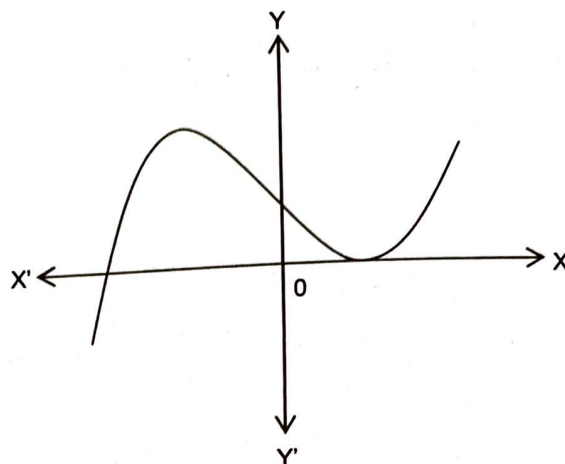


POLYNOMIALS

1. Given that $P = \frac{2}{x^2 - x - 6}$, $Q = \frac{3}{x^2 - x - 6}$, $R = \frac{4}{x^2 - 4x + 3}$, find $(P + Q) + R$
(CBSE 2005-06, 3 marks)
2. If $(x - 2)(x + 3)$ is the HCF of the polynomial
 $P(x) = (x^2 - 3x + 2)(2x^2 + 7x + a)$ and $Q(x) = (x^2 + 4x + 3)(3x^2 - 7x + b)$. Find the value of
a and b.
(CBSE 2005-06, 3 marks)
3. Solve for x: $12abx^2 - (9a^2 - 8b^2)x - 6ab = 0$
(CBSE 2005-06, 3 marks)
4. On dividing the polynomial $p(x)$ by a polynomial $g(x) = 4x^2 + 3x - 2$ the quotient
 $q(x) = 2x^2 + 2x - 1$ and remainder $r(x) = 14x - 10$. Find the polynomial $p(x)$.
(CBSE 2005-06, 3 marks)
5. Find the GCD of the following polynomial: $12x^4 + 324x$ and $36x^3 + 90x^2 - 54x$
(CBSE 2006-07, 2 marks)
6. Simplify the following rational expression in the lowest terms:
 $\left(\frac{ax^2 - x^3}{a^3 + x^3} \times \frac{a^2 - ax + x^2}{a^2x^2 + x^4} \right) \div \frac{a^2 - 2ax + x^2}{a^4 - x^4}$
(CBSE 2006-07, 3 marks)
7. If $(x + a)$ is a factor of $2x^2 + 2ax + 5x + 10$, find a.
(CBSE 2007-08, 1 mark)
8. Find all the zeros of the polynomial $x^4 + x^3 - 34x^2 - 4x + 120$, if two of its zeros are 2 and -2
(CBSE 2007-08, 2 marks)
9. For what value of k, (-4) is a zero of the polynomial $x^2 - x - (2k + 2)$? (CBSE 2008-09, 1 mark)
10. If the polynomial $6x^4 + 8x^3 + 17x^2 + 21x + 7$ is divided by another polynomial $3x^2 + 4x + 1$, the
remainder comes out to be $(ax + b)$, find a and b.
(CBSE 2008-09, 2 marks)
11. The value of p for which the polynomial $x^3 + 4x^2 - px + 8$ is exactly divisible by $(x - 2)$ is
(CBSE 2009-10, 1 mark)
(A) 0
(B) 3
(C) 5
(D) 16
12. Find the quadratic polynomial whose zeroes are $3 + \sqrt{2}$ and $3 - \sqrt{2}$. (CBSE 2009-10, 2 marks)
13. Divide $30x^4 + 11x^3 - 82x^2 - 12x + 48$ by $(3x^2 + 2x - 4)$ and verify the result by division
algorithm.
(CBSE 2009-10, 4 marks)

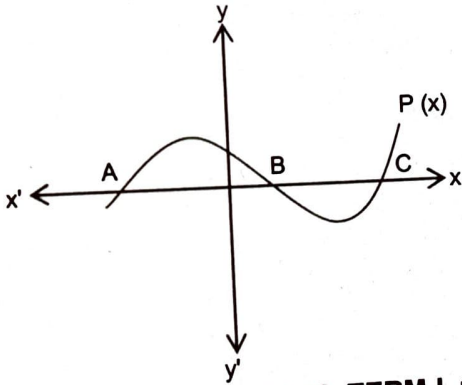
14. The graph of $y = p(x)$ is given below. The number of zeroes of $p(x)$ are:

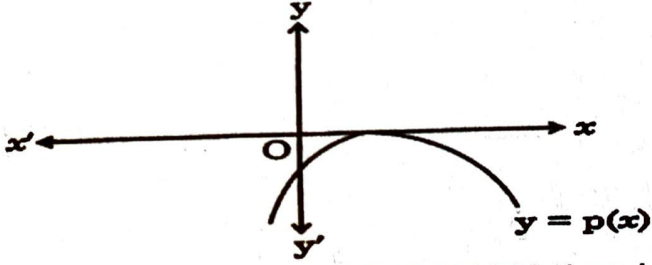
(A) 0
(B) 3
(C) 2
(D) 4



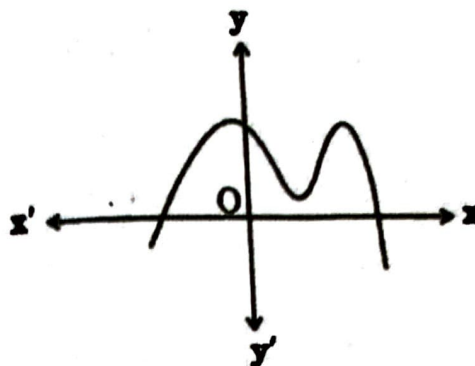
(CBSE 2010-11, 1 mark)

15. Divide $(2x^2 + x - 20)$ by $(x + 3)$ and verify the result by division algorithm.
(CBSE 2010-11, 2 marks)
16. It being given that 1 is one of the zeros of the polynomial $7x^3 - x^3 - 6$. Find its other zeros.
(CBSE 2010-11, 2 marks)
17. Obtain all the zeroes of the polynomial $f(x) = x^4 + 7x^3 + 10x^2 - 14x - 24$. If two of its zeroes are $+\sqrt{2}$ and $-\sqrt{2}$
(CBSE 2010-11, 4 marks)
18. Find the zeroes of the quadratic polynomial $x^2 - 7x + 12$ and verify the relationship between the zeroes and the coefficients.
(CBSE 2013-14, 2 marks)
19. What should be added in the polynomial $3x^4 - 4x^3 - 6x^2 + 4$ so that it is completely divisible by $x^2 - 2$
(CBSE 2013-14, 3 marks)
20. On the independence day celebration in the school, number of students participated in the celebration. School management has decided to distribute some sweets amongst the participants and the audience. If total number of sweets were represented by $8x^4 + 14x^3 - 2x^2 + 7x - 8$, each one received $2x^2 + 2x - 1$ sweets and $14x - 10$ remained undistributed, find the number of students to whom sweets were distributed.
(CBSE 2013-14, 4 marks)
21. If a polynomial $-2x^4 - 3x^3 + 6x^2 + 3x - 2$ is divided by another polynomial $-2x^2 - 3x + 4$, then remainder is $px + q$. Find the value of p and q .
(CBSE 2013-14, 4 marks)
22. Find the quadratic polynomial whose zeroes are $\sqrt{2} + 3$ and $\sqrt{2} - 3$.
(CBSE 2014-15, 3 marks)
23. Divide the polynomial $3x^4 - 5x^3 + 4x^2 + 10x - 2$ by the polynomial $x^3 - 2x$ and verify the division algorithm.
(CBSE 2014-15, 3 marks)
24. Obtain all other zeroes of the polynomial $3x^4 + 6x^3 - 2x^2 - 10x - 5$ if two of its zeroes are $\sqrt{\frac{5}{3}}$ and $-\sqrt{\frac{5}{3}}$.
(CBSE 2014-15, 4 marks)

25. Find all zeroes of the polynomial $(2x^4 - 9x^3 + 5x^2 + 3x - 1)$ if two of its zeroes are $(2 + \sqrt{3})$ and $(2 - \sqrt{3})$.
(CBSE 2017-18, 3 marks)
26. Find the value of k such that the polynomial $x^2 - (k + 6)x + 2(2k - 1)$ has sum of its zero equal to half of their product.
(CBSE 2018-19, 3 marks)
27. If one of the zeroes of the quadratic polynomial $x^2 + 3x + k$ is 2, then the value of k is
(CBSE 2019-20, 1 marks)
(A) 10 (B) -10
(C) -7 (D) -2
28. Divide the polynomial $f(x) = 3x^2 - x^3 - 3x + 5$ by the polynomial $g(x) = x - 1 - x^2$ and verify the division algorithm.
(CBSE 2019-20, 3 marks)
29. If 4 is the zero of the cubic polynomial $x^3 - 3x^2 - 10x + 24$. Find its other two zeroes.
(CBSE 2019-20, 3 marks)
30. The graph of a polynomial $p(x)$ cuts the x - axis at 3 points and touches it at 2 other points.
(CBSE 2021-22, TERM-I, 1 mark)
The number of zeroes of $p(x)$ is
(A) 1 (B) 2
(C) 3 (D) 5
31. In figure, the graph of a polynomial $P(x)$ is shown.
The number of zeroes of $P(x)$ is
(A) 1
(B) 2
(C) 3
(D) 4
- 
- (CBSE 2021-22, TERM-I, 1 mark)
32. A quadratic polynomial, the product and sum of whose zeroes are 5 and 8 respectively is
(CBSE 2021-22, TERM-I, 1 mark)
(A) $k[x^2 - 8x + 5]$ (B) $k[x^2 + 8x + 5]$
(C) $k[x^2 - 5x + 8]$ (D) $k[x^2 + 5x + 8]$
33. If $x - 1$ is a factor of the polynomial $p(x) = x^3 + ax^2 + 2b$ and $a + b = 4$, then
(CBSE 2021-22, TERM-I, 1 mark)
(A) $a = 5, b = -1$ (B) $a = 9, b = -5$
(C) $a = 7, b = -3$ (D) $a = 3, b = 1$

34. If α, β are the zeroes of the quadratic polynomial $p(x) = x^2 - (k+6)x + 2(2k-1)$ then the value of k , if $\alpha + \beta = \frac{1}{2}\alpha\beta$, is (CBSE 2021-22, TERM-I, 1 mark)
- (A) -7 (B) 7
(C) -3 (D) 3
35. The number of quadratic polynomials having zeroes -5 and -3 is (CBSE 2022-23, 1 mark)
- (A) 1 (B) 2
(C) 3 (D) more than 3
36. If α and β are the zeroes of the polynomial $x^2 - 1$, then the value of $(\alpha + \beta)$ is: (CBSE 2022-23, 1 mark)
- (A) 2 (B) 1
(C) -1 (D) 0
37. If the zeroes of the quadratic polynomial $x^2(a+1)x + b$ are 2 and -3, then (CBSE 2022-23, 1 mark)
- (A) $a = -7, b = -1$ (B) $a = 5, b = -1$
(C) $a = 2, b = -6$ (D) $a = 0, b = -6$
38. Which of the following is a quadratic polynomial with zeroes $\frac{5}{3}$ and 0? (CBSE 2022-23, 1 mark)
- (A) $3x(3x - 5)$ (B) $3x(x - 5)$
(C) $x^2 - \frac{5}{3}$ (D) $\frac{5}{3}x^2$
39. The graph of $y = p(x)$ is given, for a polynomial $p(x)$. The number of zeroes of $p(x)$ from the graph is _____. (CBSE 2022-23, 1 mark)
- (A) 3
(B) 1
(C) 2
(D) 0
- 
40. If α, β are the zeroes of a polynomial $p(x) = x^2 + x - 1$, then $\frac{1}{\alpha} + \frac{1}{\beta}$ equals to _____. (CBSE 2022-23, 1 mark)
- (A) 1 (B) 2
(C) -1 (D) $-\frac{1}{2}$
41. If α, β are the zeroes of the polynomial $p(x) = 4x^2 - 3x - 7$, then $\left(\frac{1}{\alpha} + \frac{1}{\beta}\right)$ is equal to: (CBSE 2022-23, 1 mark)
- (A) $\frac{7}{3}$ (B) $-\frac{7}{3}$
(C) $\frac{3}{7}$ (D) $-\frac{3}{7}$

42. Graph of a polynomial is given in the figure. The number of zeroes of polynomials are:



(A) 2
(C) 4

(B) 3
(D) 5

(CBSE 2022-23, 1 mark)

DIRECTION (43): Questions number 9 is Assertion and Reason based questions carrying 1 mark each. Two statements are given, one labelled as **Assertion (A)** and the other is labelled as **Reason (R)**. Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below.

- (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).
(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).
(C) Assertion (A) is true, but Reason (R) is false.
(D) Assertion (A) is false, but Reason (R) is true.

43. **Assertion (A):** Polynomial $x^2 + 4x$ has two real zeroes.
Reason (R): Zeroes of the polynomial $x^2 + ax$ ($a \neq 0$) are 0 and a .

(CBSE 2022-23, 1 mark)

44. If one zero of the polynomial $p(x) = 6x^2 + 37x - (k - 2)$ is reciprocal of the other, then find the value of k .

(CBSE 2022-23, 2 marks)

45. If (-3) is one of the zeroes of the $(k - 1)x^2 + kx + 1$, find the value of k .

(CBSE 2022-23, 2 marks)

46. Find the zeroes of the polynomial $p(x) = 2x^2 - 7x - 15$ and verify the relationship between its coefficients and zeroes.

(CBSE 2022-23, 3 marks)

47. If the sum of zeroes of the polynomial $p(x) = 2x^2 - k\sqrt{2}x + 1$ is $\sqrt{2}$, then value of k is:

(CBSE 2023-24, 1 Mark)

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

48. The zeroes of a polynomial $x^2 + px + q$ are twice the zeroes of the polynomial $4x^2 - 5x - 6$. The value of p is:

(CBSE 2023-24, 1 Mark)

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



49. If α and β are zeroes of the polynomial $5x^2 + 3x - 7$, the value of $\frac{1}{\alpha} + \frac{1}{\beta}$ is _____.
(CBSE 2023-24, 1 Mark)

(A) $-\frac{3}{7}$

(B) $\frac{3}{5}$

(C) $\frac{3}{7}$

(D) $-\frac{5}{7}$

50. The zeroes of the quadratic polynomial $2x^2 - 3x - 9$ are:
(CBSE 2023-24, 1 Mark)

(A) $3, \frac{-3}{2}$

(B) $-3, \frac{-3}{2}$

(C) $-3, \frac{3}{2}$

(D) $3, \frac{3}{2}$

51. If a polynomial $p(x)$ is given by $p(x) = x^2 - 5x + 6$, then the value of $p(1) + p(4)$ is:
(CBSE 2023-24, 1 Mark)

(A) 0
(C) 2

(B) 4
(D) -4

52. If α and β are the zeroes of the polynomial $p(x) = kx^2 - 30x + 45k$ and $\alpha + \beta = \alpha\beta$, then the value of k is:
(CBSE 2023-24, 1 Mark)

(A) $-\frac{2}{3}$

(B) $-\frac{3}{2}$

(C) $\frac{3}{2}$

(D) $\frac{2}{3}$

Direction: In Q. No 53 is Assertion and Reason based questions carrying 1 mark each. Two statements are given, one labeled as Assertion (A) and the other is labeled as Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below:
(CBSE 2023-24, 1 Mark)

- (A) Both, Assertion (A) and Reason (R) are true and Reason (R) is correct explanation of Assertion (A).
(B) Both, Assertion (A) and Reason (R) are true and Reason (R) is not correct explanation of Assertion (A).
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

53. Assertion (A): Degree of a zero polynomial is not defined.
Reason (R): Degree of a non-zero constant polynomial is 0.

Direction: In Q. No 54 is a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option.
(CBSE 2023-24, 1 Mark)

- (A) both, Assertion (A) and Reason (R) are true and Reason (R) is correct explanation of Assertion (A).
(B) both, Assertion (A) and Reason (R) are true and Reason (R) is not correct explanation of Assertion (A).
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

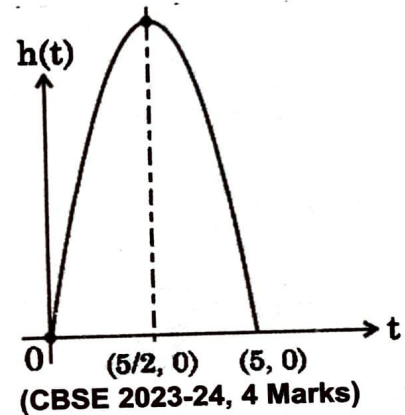
54. Assertion (A): If the graph of a polynomial touches x-axis at only one point, then the polynomial cannot be a quadratic polynomial.
Reason (R): A polynomial of degree $n(n > 1)$ can have at most n zeroes.



55. If α, β are the zeroes of the polynomial $p(x) = 5x^2 - 6x + 1$, then find the value of $\alpha + \beta + \alpha\beta$.
(CBSE 2023-24, 2 Marks)
56. (a) Find the zeroes of the polynomial $4x^2 + 4x - 3$ and verify the relationship between zeroes and coefficients of the polynomial.
(CBSE 2023-24, 3 Marks)
- OR
- (b) If α and β are the zeroes of the polynomial $x^2 + x - 2$, then find the value of $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$.
57. Find the zeroes of the quadratic polynomial $x^2 - 15$ and verify the relationship between the zeroes and the coefficients of the polynomial.
(CBSE 2023-24, 3 Marks)

Case Study

58. A ball is thrown in the air so that t seconds after it is thrown, its height h meter above its starting point is given by the polynomial $h = 25t - 5t^2$



Observe the graph of the polynomial and answer the following questions:

- (i) Write zeroes of the given polynomial.
(ii) Find the maximum height achieved by ball.
(iii) (a) After throwing upward, how much time did the ball take to reach to the height of 30 m
OR
(b) Find the two different values of t when the height of the ball was 20 m.