NCERT Solutions Class 9 Maths
Chapter 2: Polynomials
EXERCISE 2.3

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Quick Summary: In NCERT Solutions Class 9 Maths Chapter 2 Exercise 2.3, students learn to apply the Remainder Theorem and Factor Theorem to solve polynomial problems systematically. This exercise covers finding remainders when polynomials are divided by linear expressions, determining factors of polynomials, and factorizing quadratic and cubic polynomials, which are essential concepts for CBSE Class 9 board exams and higher mathematics.

Key Takeaways:

- **Remainder Theorem:** When polynomial p(x) is divided by (x - a), the remainder equals p(a)
- **Factor Theorem:** (x - a) is a factor of p(x) if and only if p(a) = 0
- **Factorization Methods:** Use splitting middle term for quadratic polynomials and factor theorem for cubic polynomials
- **Exam Strategy:** These theorems help verify polynomial factors quickly without performing long division

Complete Solutions

Question 1

QUESTION

Determine which of the following polynomials has (x + 1) as a factor:

(i) x^3 + x^2 + x + 1
(ii) x^4 + x^3 + x^2 + x + 1
(iii) x^4 + 3x^3 + 3x^2 + x + 1
(iv) x^3 - x^2 - (2 + √2)x + √2

SOLUTION

We need to determine if is a factor of the given polynomials. We can use the Factor Theorem, which states that if , then is a factor of the polynomial .

(i)

Step 1: Evaluate

Step 2: Conclusion

Since , is a factor of .

(ii)

Step 1: Evaluate

Step 2: Conclusion

Since , is not a factor of .

(iii)

Step 1: Evaluate

Step 2: Conclusion

Since , is not a factor of .

(iv)

Step 1: Evaluate

Step 2: Conclusion

Since , is not a factor of .

Final Answer: is a factor of (i), but not a factor of (ii), (iii), and (iv).

ANSWER

(x + 1) is a factor of (i), but not a factor of (ii), (iii), and (iv).

Question 2

QUESTION

Use the Factor Theorem to determine whether g(x) is a factor of p(x) in each case:

(i) p(x) = 2x^3 + x^2 - 2x - 1, g(x) = x + 1
(ii) p(x) = x^3 + 3x^2 + 3x + 1, g(x) = x + 2
(iii) p(x) = x^3 - 4x^2 + x + 6, g(x) = x - 3

SOLUTION

This question tests the understanding of the Factor Theorem, which states that a polynomial is a factor of a polynomial if and only if , where is a root of .

(i) ,

Step 1: Find the root of

We set to find its root:

So, .

Step 2: Evaluate

We need to find :

Step 3: Conclude

Since , by the Factor Theorem, is a factor of .

Answer: Yes

(ii) ,

Step 1: Find the root of

We set to find its root:

So, .

Step 2: Evaluate

We need to find :

Step 3: Conclude

Since , by the Factor Theorem, is not a factor of .

Answer: No

(iii) ,

Step 1: Find the root of

We set to find its root:

So, .

Step 2: Evaluate

We need to find :

Step 3: Conclude

Since , by the Factor Theorem, is a factor of .

Answer: Yes

ANSWER

(i) Yes

(ii) No

(iii) Yes

Question 3

QUESTION

Find the value of k, if x - 1 is a factor of p(x) in each of the following cases:

(i) p(x) = x^2 + x + k
(ii) p(x) = 2x^2 + kx + √2
(iii) p(x) = kx^2 - √2x + 1
(iv) p(x) = kx^2 - 3x + k

SOLUTION

We are given that is a factor of the polynomial in each case, and we need to find the value of . This problem uses the Factor Theorem, which states that if is a factor of , then .

(i)

Step 1: Apply the Factor Theorem

Since is a factor, .

Step 2: Substitute into

Step 3: Solve for

Final Answer:

(ii)

Step 1: Apply the Factor Theorem

Since is a factor, .

Step 2: Substitute into

Step 3: Solve for

Final Answer:

(iii)

Step 1: Apply the Factor Theorem

Since is a factor, .

Step 2: Substitute into

Step 3: Solve for

Final Answer:

(iv)

Step 1: Apply the Factor Theorem

Since is a factor, .

Step 2: Substitute into

Step 3: Solve for

Final Answer:

ANSWER

(i) -2

(ii) -(2 + √2)

(iii) √2 - 1

(iv) (3)/(2)

Question 4

QUESTION

Factorise the following:

(i) 12x^2 - 7x + 1
(ii) 2x^2 + 7x + 3
(iii) 6x^2 + 5x - 6
(iv) 3x^2 - x - 4

SOLUTION

This question tests our ability to factorize quadratic polynomials using the splitting the middle term method.

(i) Factorize

Step 1: Find two numbers such that their sum is -7 and their product is .

The two numbers are -4 and -3 because and .

Step 2: Split the middle term using these two numbers.

Step 3: Group the terms and factor out common factors.

Step 4: Factor out the common binomial factor.

Final Answer:

(ii) Factorize

Step 1: Find two numbers such that their sum is 7 and their product is .

The two numbers are 6 and 1 because and .

Step 2: Split the middle term using these two numbers.

Step 3: Group the terms and factor out common factors.

Step 4: Factor out the common binomial factor.

Final Answer:

(iii) Factorize

Step 1: Find two numbers such that their sum is 5 and their product is .

The two numbers are 9 and -4 because and .

Step 2: Split the middle term using these two numbers.

Step 3: Group the terms and factor out common factors.

Step 4: Factor out the common binomial factor.

Final Answer:

(iv) Factorize

Step 1: Find two numbers such that their sum is -1 and their product is .

The two numbers are -4 and 3 because and .

Step 2: Split the middle term using these two numbers.

Step 3: Group the terms and factor out common factors.

Step 4: Factor out the common binomial factor.

Final Answer:

ANSWER

(i) (3x - 1)(4x - 1)

(ii) (x + 3)(2x + 1)

(iii) (2x + 3)(3x - 2)

(iv) (x + 1)(3x - 4)

Question 5

QUESTION

Factorise the following:

(i) x^3 - 2x^2 - x + 2
(ii) x^3 - 3x^2 - 9x - 5
(iii) x^3 + 13x^2 + 32x + 20
(iv) 2y^3 + y^2 - 2y - 1

SOLUTION

This question tests our ability to factorize cubic polynomials using the factor theorem and synthetic division or by grouping terms.

(i)

Step 1: Look for possible factors by grouping

We can group the terms as follows:

Step 2: Factor out common terms from each group

Step 3: Factor out the common binomial factor

Step 4: Factor the difference of squares

Recognize that is a difference of squares: . Therefore, it factors to .

Final Answer:

(ii)

Step 1: Use the Factor Theorem to find a root

We look for a value of that makes the polynomial equal to zero. By trial and error, we find that is a root:

Therefore, is a factor.

Step 2: Divide the polynomial by

We can use synthetic division or polynomial long division. Using synthetic division:

\begin{array}{c|cccc} -1 & 1 & -3 & -9 & -5 \\ & & -1 & 4 & 5 \\ \hline & 1 & -4 & -5 & 0 \end{array}

The quotient is .

Step 3: Factor the quadratic

Step 4: Write the complete factorization

Final Answer:

(iii)

Step 1: Use the Factor Theorem to find a root

By trial and error, we find that is a root:

Therefore, is a factor.

Step 2: Divide the polynomial by

Using synthetic division:

\begin{array}{c|cccc} -1 & 1 & 13 & 32 & 20 \\ & & -1 & -12 & -20 \\ \hline & 1 & 12 & 20 & 0 \end{array}

The quotient is .

Step 3: Factor the quadratic

Step 4: Write the complete factorization

Final Answer:

(iv)

Step 1: Look for possible factors by grouping

We can group the terms as follows:

Step 2: Factor out common terms from each group

Step 3: Factor out the common binomial factor

Step 4: Factor the difference of squares

Recognize that is a difference of squares: . Therefore, it factors to .

Final Answer:

> **ANSWER**
>
> (i) (x - 2)(x - 1)(x + 1)
>
> (ii) (x + 1)(x + 1)(x - 5)
>
> (iii) (x + 1)(x + 2)(x + 10)
>
> (iv) (y - 1)(y + 1)(2y + 1)

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📌 Key Formulas

Important Formulas for Exercise 2.3

Formula / Concept	Description
Remainder Theorem	If a polynomial p(x) of degree greater than or equal to one is divided by a linear polynomial x - a, then the remainder is p(a).
Factor Theorem	If p(x) is a polynomial of degree n \ge 1 and 'a' is any real number, then: (i) x - a is a factor of p(x) if p(a) = 0. (ii) p(a) = 0 if x - a is a factor of p(x).
Division Algorithm for Polynomials	If p(x) and g(x) are two polynomials such that degree of p(x) \ge degree of g(x) and g(x) \ne 0, then we can find polynomials q(x) and r(x) such that: p(x) = g(x) · q(x) + r(x) where r(x) = 0 or degree of r(x) < degree of g(x). This is also expressed as: Dividend = (Divisor × Quotient) + Remainder.
Zero of a Polynomial	A real number 'a' is called a zero of the polynomial p(x) if p(a) = 0. For the divisor x-a, the zero is a.

❓ Top FAQs

Q1. How many questions are in NCERT Solutions Class 9 Maths Chapter 2 Polynomials Exercise 2.3?

Exercise 2.3 of NCERT Solutions for Class 9 Maths Chapter 2 Polynomials contains exactly 5 questions. These questions focus on the application of Remainder Theorem and Factor Theorem, which are fundamental concepts in Algebra for CBSE board exam 2025-26.

Q2. Where can I download free PDF of NCERT Solutions for Class 9 Maths Chapter 2 Polynomials Exercise 2.3?

You can download the free PDF of NCERT Solutions for Class 9 Maths Chapter 2 Polynomials Exercise 2.3 from the official NCERT website or various educational platforms that provide step by step solutions. These PDFs are updated as per the CBSE syllabus 2025-26 and include detailed explanations of Remainder Theorem applications.

Q3. How many marks does Polynomials Chapter 2 carry in CBSE Class 9 Maths board exam 2025-26?

Polynomials is part of Unit II - Algebra, which carries approximately 10 marks in the CBSE Class 9 Maths board exam 2025-26. Exercise 2.3 focusing on Remainder Theorem and Factor Theorem is crucial for scoring well in this unit.

Q4. Which is the most difficult question in NCERT Solutions Class 9 Maths Chapter 2 Polynomials Exercise 2.3?

Question 5 of Exercise 2.3 in NCERT Solutions Class 9 Maths Chapter 2 Polynomials is generally considered the most challenging as it requires advanced application of Factor Theorem. Students are advised to practice step by step solutions and understand the concept thoroughly for CBSE board exam 2025-26 preparation.

Q5. What is Remainder Theorem explained in NCERT Solutions Class 9 Maths Chapter 2 Polynomials Exercise 2.3?

The Remainder Theorem states that when a polynomial p(x) is divided by (x - a), the remainder is p(a). Exercise 2.3 of NCERT Solutions for Class 9 Maths Chapter 2 Polynomials provides step by step solutions to help students apply this theorem effectively for CBSE board exam 2025-26.

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