



BAL BHARATI PUBLIC SCHOOL , PITAMPURA

Class -9 Mathematics

POLYNOMIALS (Part – 5)

Guidelines :

Dear Students

Kindly read the content given below and view the links shared for better understanding.

- Solve the given questions in the **yellow register** provided in the notebook set.

Link for the chapter : <http://ncert.nic.in/textbook/textbook.htm?jemh1=3-15>

Introduction :

In this lesson we will learn “ **Remainder Theorem** “

When you divide one [polynomial](#) by another using the long division method described in previous lesson, the process can be very long. The [Remainder](#) and [Factor Theorems](#) help us avoid this long division [process](#) by providing certain rules. We will learn about the **Remainder Theorem** in this lesson.

Remainder theorem: Let $p(x)$ be any polynomial of degree greater than or equal to 1 and let a be any real number. If $p(x)$ is divided by the linear polynomial $x - a$, then the remainder is $p(a)$.

Example 1: Find the remainder when $p(x) = x^4 + x^3 - 2x^2 + x + 1$ is divided by $x - 1$.

Solution: Zero of $x - 1$ is 1, so by using remainder theorem, remainder in this case will be $p(1)$.

$$\text{So, } p(1) = (1)^4 + (1)^3 - 2(1)^2 + 1 + 1 = 2$$

(**Note : $x - 1 = 0$, therefore $x = 1$)**

Example 2: Find the remainder when $x^4 + x^3 - 2x^2 + x + 1$ is divided by $(x - 1)$.

Solution : Dividend = $p(x) = x^4 + x^3 - 2x^2 + x + 1$ and Divisor = $x - 1$

Zero of the divisor polynomial is $x - 1 = 0$ or, $x = 1$.

Therefore, $p(1) = (1)^4 + (1)^3 - 2(1)^2 + 1 + 1 = 1 + 1 - 2 + 1 + 1 = 2$.

So, by using Remainder Theorem, the remainder is 2.

Example 3: Find the remainder when $(x^3 - ax^2 + 6x - a)$ is divided by $(x - a)$.

Solution : Dividend Polynomial = $p(x) = x^3 - ax^2 + 6x - a$ and Divisor Polynomial = $x - a$

Zero of the divisor polynomial is $x - a = 0$ or, $x = a$.

Therefore, $p(a) = (a)^3 - a(a)^2 + 6a - a = a^3 - a^3 + 6a - a = 5a$

So, by Remainder Theorem, the remainder is $5a$.

Key points and important links for reference :

Refer to this link to enhance your knowledge : [https://examfear.com/free-video-lesson/Class-9/Maths/Polynomials/part-9/Polynomials Part 9 \(Remainder theorem\).htm](https://examfear.com/free-video-lesson/Class-9/Maths/Polynomials/part-9/Polynomials%20Part%209%20(Remainder%20theorem).htm)

Comparison showing division of polynomials by Long Division Method and by Remainder Theorem :

<https://www.khanacademy.org/math/algebra2/x2ec2f6f830c9fb89:poly-div/x2ec2f6f830c9fb89:remainder-theorem/v/polynomial-remainder-theorem>

Following questions are to be done in the register :

Exercise 2.3 Q1 (ii) , (iv) (By Remainder Theorem)

Q2.

ASSIGNMENT :-

Note : Following questions are for practice only and should be done in a separate practice register/copy of maths

Use **REMAINDER THEOREM** to find remainder :

1. $(x^2 + 7x + 12) \div (x + 3)$

2. $(15x^2 + 26x + 8) \div (5x + 2)$

3. $(4x^2 + 8x - 5) \div (2x + 1)$

4. $(x^4 + 3x^2 - 6x - 10) \div (x^2 + 3x - 5)$

5. $(5x^3 - 6x^2 - 28x - 2) \div (x + 2)$

6. $(x^3 - 1) \div (x - 1)$

NOTE: Compare the answers of the questions you calculated using long division method in the previous lesson and answers of questions given above by using remainder theorem . You will find that answers we get from both the methods are the same .