## *DAY 4*

### ***Division Algorithm***

By Euclid's Division Algorithm $a = bq + r$ or Dividend = Divisor × Quotient +Remainder

Euclid's Division is for integers.

In this section we will discuss division algorithm for polynomials

### ***Division Algorithm for polynomials***

If $f(x)$ & $g(x)$ are any two polynomials real coefficients & $g(x) \neq 0$ then there exists polynomial $q(x), r(x)$ such that

$$\boldsymbol{f(x) = g(x) \times q(x) + r(x)\,;\, 0 \leq r(x)} < g(x)$$

Where $q(x)$ is called quotient & $r(x)$ is called remainder

**1. Divide polynomial $2x^2 + 3x + 1$ by polynomial $x + 2$.** **[NCERT Ex. 6]**

**Sol:-**

$$
\begin{array}{r|l}
 & 2x - 1 \text{(Quotient)} \\
x + 2 & 2x^2 + 3x + 1 \\
 & \pm 2x^2 \pm 4x \\
\hline
 & -x + 1 \\
 & \mp x \mp 2 \\
\hline
 & 3 \text{ (Remainder)}
\end{array}
$$



**2. Divide polynomial $3x^2 + 2x + 4$ by polynomial $x - 1$**

**Sol:-**

$$
\begin{array}{r|l}
 & 3x + 5 \text{(Quotient)} \\
x - 1 & 3x^2 + 2x + 4 \\
 & \pm 3x^2 \mp 3x \\
\hline
 & 5x + 4 \\
 & \pm 5x \mp 5 \\
\hline
 & 9 \text{ (Remainder)}
\end{array}
$$

**3. Divide polynomial $f(x) = 2x^3 - 3x^2 + 10x - 8$ by $g(x) = x + 5$**

**Sol:-**

$$
\begin{array}{r|l}
 & 2x^2 - 13x + 75 \\
x + 5 & 2x^3 - 3x^2 + 10x - 8 \\
 & \pm 2x^3 \pm 10x^2 \\
\hline
 & -13x^2 + 10x \\
 & \mp 13x^2 \mp 65x \\
\hline
 & 75x - 8 \\
 & \pm 75x \pm 375 \\
\hline
 & -383
\end{array}
$$

$$\text{Here } q(x) = 2x^2 - 13x + 75, r(x) = -383$$

By Division Algorithm

$$2x^3 - 3x^2 + 10x - 8 = (x+5)(2x^2 - 13x + 75) - 383$$

## ***EXERCISE***

**1. Divide polynomial $p(x)$ by the polynomial $g(x)$ & find quotient & remainder**

***i***) $p(x) = x^4 - 3x^2 + 4x + 5$ ; $g(x) = x^2 + 1 + x$

***ii***) $p(x) = x^3 - 3x^2 + 5x - 3$ ; $g(x) = x^2 - 2$

***iii***) $p(x) = x^4 - 5x + 6$ ; $g(x) = 2 - x^2$

**2. Check by Division Algorithm whether the first polynomial is a factor of second**

$i$) $x^2 - 2$ ; $2x^4 - 3x^3 - 3x^2 + 6x - 2$

$ii$) $y - 2$ ; $2y^3 - 5y^2 - 19y + 42$