POLYNOMIALS

PPT-4

SUBJECT : MATHEMATICS
CHAPTER NUMBER: 02
CHAPTER NAME : POLYNOMIALS

CHANGING YOUR TOMORROW

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Learning outcome

- 1.Students will be able to know Division algorithm for polynomials
  2. Students will be able to establish relationship among dividend,divisior,quotient and the remainder.

PREVIOUS KNOWLEDGE TEST

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Relationship between the zeros and the coefficients of a polynomial:

(i) If α, β are zeros of $p(x) = ax^2 + bx + c$, then

$$\text{Sum of zeros} = \alpha + \beta = \frac{-b}{a} = \frac{-(\text{Coefficient of } x)}{\text{Coefficient of } x^2}$$

$$\text{Product of zeros} = \alpha\beta = \frac{c}{a} = \frac{\text{Constant term}}{\text{Coefficient of } x^2}$$

(ii) If α, β, γ are zeros of $p(x) = ax^3 + bx^2 + cx + d$, then

$$\alpha + \beta + \gamma = \frac{-b}{a} = \frac{-(\text{Coefficient of } x^2)}{\text{Coefficient of } x^3}$$

$$\alpha\beta + \beta\gamma + \gamma\alpha = \frac{c}{a} = \frac{\text{Coefficient of } x}{\text{Coefficient of } x^3}$$

$$\alpha\beta\gamma = \frac{-d}{a} = \frac{-(\text{Constant term})}{\text{Coefficient of } x^3}$$

(iii) If α, β are roots of a quadratic polynomial $p(x)$, then

$p(x) = x^2 -$ (sum of zeros) x + product of zeros

$\Rightarrow p(x) = x^2 - (\alpha + \beta)x + \alpha\beta$

(iv) If α, β, γ are the roots of a cubic polynomial $p(x)$, then

$p(x) = x^3 -$ (sum of zeros) x^2 + (sum of product of zeros taken two at a time) x − product of zeros

$\Rightarrow p(x) = x^3 - (\alpha + \beta + \gamma)x^2 + (\alpha\beta + \beta\gamma + \gamma\alpha)x - \alpha\beta\gamma$

- Division Algorithm for polynomials
- If $p(x)$ and $g(x)$ are any two polynomials with $g(x) \neq 0$, then we can find polynomials $q(x)$ and $r(x)$ such that $p(x) = g(x) \times q(x) + r(x)$, where $r(x) = 0$ or degree of $r(x)$ < degree of $g(x)$
- https://youtu.be/vs2GYsMn9vw

- Some more Division Algorithm for polynomials
- https://youtu.be/a9-ME46dX18 (10.43)

- Divide the polynomial p(x) by the polynomial g(x) and find the quotient and remainder in the following :$p(x) = x^3 - 3x^2 + 5x - 3,\ g(x) = x^2 - 2$

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

dividing $p(x)$ by $g(x)$

$$\begin{array}{r|l} & x - 3 \\ x^2 - 2 & x^3 - 3x^3 + 5x - 3 \\ & \underset{-}{x^3} \qquad \underset{+}{-} 2x \\ \hline & -3x^2 + 7x - 3 \\ & \underset{+}{-3x^2} \qquad \underset{-}{+6} \\ \hline & 7x - 9 \\ \hline \end{array}$$

Quotient = $x - 3$, Remainder = $7x - 9$

Check whether the first polynomial is a factor of the second polynomial by dividing the second polynomial by the first polynomial.

- $t^2 - 3, 2t^4 + 3t^3 - 2t^2 - 9t - 12$

(*ii*) We have,

$$
\begin{array}{r|l}
 & 2t^2 + 3t + 4 \\
\hline
t^2 - 3 & 2t^4 + 3t^3 - 2t^2 - 9t - 12 \\
 & \underline{2t^4 \qquad \mp 6t^2} \\
 & \qquad 3t^3 + 4t^2 - 9t \\
 & \qquad \underline{3t^3 \qquad \mp 9t} \\
 & \qquad\qquad 4t^2 - 12 \\
 & \qquad\qquad \underline{4t^2 \mp 12} \\
 & \qquad\qquad\quad 0
\end{array}
$$

Clearly, remainder is zero, so $t^2 - 3$ is a factor of polynomial $2t^4 + 3t^3 - 2t^2 - 9t - 12$.

:HOME ASSIGNMENT Ex. 2.2 Q. No 1 to 21.

AHA

1. If the polynomial $x^4 + 2x^3 + 8x^2 + 12x + 18$ is divided by another polynomial $x^2 + 5$, the remainder comes out to be $px + q$. Find the values of p and q.

2. If the polynomial $6x^4 + 8x^3 - 5x^2 + ax + b$ is exactly divisible by the polynomial $2x^2 - 5$, then find the values of a and b.

3. If the polynomial $x^4 - 6x^3 + 16x^2 - 25x + 10$ is divided by another polynomial $x^2 - 2x + k$, the remainder comes out to be $x + a$, find the values of k and a.

THANKING YOU

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