Brainbox learn easy

Chapter 02

POLYNOMIALS

Division algorithm for polynomials:

Dividend = (Divisor x Quotient) + Remainder

Where remainder is ‘0’ or a polynomial of degree less than that of divisor.

Example:

Divide $3x^2+x^3+3x+1$ by $x+1$.

Solution:

Step 1:

Arrange the terms of the dividend and divisor in descending (ascending) order of their degrees.

i.e., x^3+3x^2+3x+1 and $x+1$.

$$\underset{(\textbf{Divisor})}{x+1}\Big)\ \underset{(\textbf{Dividend})}{x^3+3x^2+3x+1}\Big(\ \underset{(\textbf{Quotient})}{?}$$

Step 2:

We get first term of quotient by dividing the first term of dividend with the first term of divisor.

i.e., $\frac{x^3}{x}=x^2$,

So first term of quotient $=x^2$.

$$\begin{array}{l} x+1\big)\,x^3+3x^2+3x+1\,\big(x^2 \\ \qquad\quad \underline{x^3+x^2\qquad\qquad\qquad} \end{array}$$

Step 3:

Multiply the divisor by the first term of the quotient and subtract the result from the dividend to get remainder.

i.e,.

$$
\begin{array}{l}
x+1)\,\cancel{x^3}+3x^2+3x+1\,(\,x^2 \\
\quad {}_{(-)}\cancel{x^3}+_{(-)}x^2 \quad \downarrow \quad \downarrow \\
\hline
\qquad\qquad 2x^2+3x+1 \rightarrow \text{Remainder}
\end{array}
$$

Step 4:

Do the same as in step 2 to get second term of quotient by taking the remainder in step 3 as dividend.

i.e.,

$$
\begin{array}{l}
x+1)\,\cancel{x^3}+3x^2+3x+1\,(\,x^2+2x+1 \\
\quad {}_{(-)}\cancel{x^3}+_{(-)}x^2 \\
\hline
\qquad\qquad 2\cancel{x^2}+3x+1 \\
\qquad\quad {}_{(-)}\cancel{2x^2}+_{(-)}2x\downarrow \qquad \text{By step-2:}\ \dfrac{2x^2}{x}=\dfrac{2x.\cancel{x}}{\cancel{x}}=2x \\
\hline
\qquad\qquad\quad \cancel{x}+\cancel{1} \qquad\qquad \text{By step-3: subtract.} \\
\qquad\qquad {}_{(-)}\cancel{x}+_{(-)}\cancel{1} \\
\hline
\qquad\qquad\quad 0 \quad \rightarrow \text{Remainder} \\
\hline
\end{array}
$$

Step 5:

Repeat the above process till we obtain a remainder which is either zero or a polynomial of degree less than that of the divisor. i.e., **<u>0</u>**.