Lecture 9

Module 31

Exercise 2.3

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

(i) $2t^4 + 3t^3 - 2t^2 - 9t - 12,\ t^2 - 3$

Sol. Dividend $= 2t^4 + 3t^3 - 2t^2 - 9t - 12$

Divisor $= t^2 - 3$

$$
\begin{array}{r|l}
 & 2t^2 + 3t + 4 \\
\hline
t^2 - 3 & \cancel{2t^4} + 3t^3 - 2t^2 - 9t - 12 \\
 & \underset{(-)}{\cancel{2t^4}} \qquad \underset{(+)}{-}\ 6t^2 \\
\hline
 & +\cancel{3t^3} + 4t^2 - \cancel{9t} - 12 \\
 & \underset{(-)}{\cancel{3t^3}} \qquad \underset{(+)}{-}\cancel{9t} \\
\hline
 & +\cancel{4t^2} \qquad - \cancel{12} \\
 & \underset{(-)}{\cancel{4t^2}} \qquad \underset{(+)}{-}\cancel{12} \\
\hline
 & 0
\end{array}
$$

$$\frac{2\cancel{t^4}^{\,2}}{\cancel{t^2}} = 2t^2 \qquad 2t^2(t^2 - 3) = 2t^4 - 6t^2$$

$$\frac{3\cancel{t^3}}{\cancel{t^2}} = 3t \qquad 3t\,(t^2 - 3) = 3t^3 - 9t$$

$$\frac{4\cancel{t^2}}{\cancel{t^2}} = 4 \qquad 4\,(t^2 - 3) = 4t^2 - 12$$

$\therefore$ Quotient $= 2t^2 + 3t + 4$

Remainder $= 0$

Module 32

Exercise 2.3

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

(ii) $3x^4 + 5x^3 - 7x^2 + 2x + 2,\ x^2 + 3x + 1$

Sol. Dividend $= 3x^4 + 5x^3 - 7x^2 + 2x + 2$

Divisor $= x^2 + 3x + 1$

$$
\begin{array}{r|l}
 & 3x^2 - 4x + 2 \\ \hline
x^2 + 3x + 1 & \cancel{3x^4} + 5x^3 - 7x^2 + 2x + 2 \\
 & \cancel{3x^4} + 9x^3 + 3x^2 \\
 & (-) \quad (-) \quad (-) \\ \hline
 & \cancel{-4x^3} - 10x^2 + 2x + 2 \\
 & \cancel{-4x^3} - 12x^2 - 4x \\
 & (+) \quad (+) \quad (+) \\ \hline
 & \cancel{2x^2} + \cancel{6x} + \cancel{2} \\
 & \cancel{2x^2} + \cancel{6x} + \cancel{2} \\
 & (-) \quad (-) \quad (-) \\ \hline
 & 0
\end{array}
$$

$\frac{3x^4}{x^2} = 3x^2$ | $3x^2(x^2 + 3x + 1) = 3x^4 + 9x^3 + 3x^2$

$\frac{-4x^3}{x^2} = -4x$ | $-4x(x^2 + 3x + 1) = -4x^3 - 12x^2 - 4x$

$\frac{2x^2}{x^2} = 2$ | $2(x^2 + 3x + 1) = 2x^2 + 6x + 2$

$\therefore$ Quotient $= 3x^2 - 4x + 2$

Remainder $= 0$

Module 33

Exercise 2.3

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

(iii) $x^5 - 4x^3 + x^2 + 3x + 1,\ x^3 - 3x + 1$

Sol. Dividend $= x^5 - 4x^3 + x^2 + 3x + 1x^0$

$= x^5 + 0x^4 - 4x^3 + x^2 + 3x + 1$

Divisor $= x^3 - 3x + 1$

$$
\begin{array}{r|l}
 & x^2 - 1 \\
\hline
x^3 - 3x + 1 & \cancel{x^5} + 0x^4 - 4x^3 + \cancel{x^2} + 3x + 1 \\
 & \cancel{x^5} \quad - 3x^3 + \cancel{x^2} \\
 & (-) \quad (+) \quad (-) \\
\hline
 & -\cancel{x^3} \quad + \cancel{3x} + 1 \\
 & -\cancel{x^3} \quad + \cancel{3x} - 1 \\
 & (+) \quad (-) \quad (+) \\
\hline
 & 2
\end{array}
$$

$\frac{x^5}{x^3} = x^2$ | $x^2(x^3 - 3x + 1) = x^5 - 3x^3 + x^2$

$\frac{-x^3}{x^3} = -1$ | $-1(x^3 - 3x + 1) = -x^3 + 3x - 1$

Quotient $= x^2 - 1$

Remainder $= 2$

Thank You