Exercise 8.5

Q.1 Divide the first polynomial by the second polynomial in each of the following. Also write the quotient and remainder.

(i) $3x^2+4x+5$, $x-2$

Sol: $\dfrac{3x^2+4x+5}{x-2} =$

$$
\begin{array}{r|l}
 & 3x+10 \\
\hline
x-2 & 3x^2+4x+5 \\
 & \underset{-}{3x^2}\underset{+}{-6x} \\
\hline
 & \quad 10x+5 \\
 & \quad \underset{-}{10x}\underset{+}{-20} \\
\hline
 & \quad\quad 25
\end{array}
$$

$\therefore$ Q = $3x+10$, remainder = 25

(ii) $10x^2-7x+8$ by $5x-3$

Solution:

$$
\begin{array}{r|l}
 & 2x-\frac{1}{5} \\
\hline
5x-3 & 10x^2-7x+8 \\
 & \underset{-}{10x^2}\underset{+}{-6x} \\
\hline
 & \quad -x+8 \\
 & \quad -x+\frac{3}{5} \\
 & \quad \underset{+}{}\quad \underset{-}{\frac{}{5}} \\
\hline
 & \quad\quad 8-\frac{3}{5}
\end{array}
$$

$= \dfrac{40-3}{5} = \dfrac{37}{5}.$

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(iii) $5y^3 - 6y^2 + 6y - 1$ by $5y - 1$

Sol:

$$
\begin{array}{r|l}
 & y^2 - y + 1 \\
\hline
5y - 1 & 5y^3 - 6y^2 + 6y - 1 \\
 & \underline{5y^3 - y^2} \\
 & \quad -5y^2 + 6y - 1 \\
 & \quad \underline{-5y^2 + y} \\
 & \quad\quad 5y - 1 \\
 & \quad\quad \underline{5y - 1} \\
 & \quad\quad\quad 0
\end{array}
$$

$\therefore Q = y^2 - y + 1$, Remainder $= 0$

(iv) $x^4 - x^3 + 5x$ by $x - 1$

Sol:

$$
\begin{array}{r|l}
 & x^3 + 5 \\
\hline
x - 1 & x^4 - x^3 + 5x \\
 & \underline{x^4 - x^3} \\
 & \quad 5x \\
 & \quad \underline{5x - 5} \\
 & \quad\quad 5
\end{array}
$$

$\therefore Q = x^3 + 5$, Remainder $= 5$

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(v) y^4+y^2 by $y^2=2$

Sol:

$$
\begin{array}{r|l}
 & y^2+3 \\
\hline
y^2=2 & y^4+y^2 \\
 & y^4-2y^2 \\
 & - \quad + \\
\hline
 & 3y^2 \\
 & 3y^2-6 \\
 & -\quad + \\
\hline
 & 6
\end{array}
$$

$\therefore$ Q = y^2+3, Remainder = 6

$\therefore$ $y^2=2$ is not a factor.

Q.2 Find, whether or not the first polynomial is a factor of the second.

(i) $x+1$, $2x^2+5x+4$

Sol:

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

$\therefore$ Q = $2x+3$, Remainder = 1

$\therefore$ $x+1$ is not a factor.

(ii) $y-2$, $3y^3+5y^2+5y+2$

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Sol:

$$y-2 \;\overline{)\; 3y^3+5y^2+5y+2 \;}\;\; 3y^2+11y+27$$

$$-(3y^3-6y^2)$$

$$11y^2+5y+2$$

$$-(11y^2-22y)$$

$$27y+2$$

$$-(27y-54)$$

$$56$$

$\therefore$ Remainder $= 56$

$\therefore$ $y-2$ is not a factor of $3y^3+5y^2+5y+2$

(iii) $4x^2-5$, $4x^4+7x^2+15$

Sol:

$$4x^2-5 \;\overline{)\; 4x^4+7x^2+15 \;}\;\; x^2+3$$

$$-(4x^4-5x^2)$$

$$12x^2+0x+15$$

$$-(12x^2-15)$$

$$30$$

$\therefore$ Remainder $= 30$

Therfore it is not a factor.

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(IV) $4-z$, $3z^2-13z+4$

Sol:

$$\begin{array}{r|l} -z+4 & -3z+1 \\ \hline & 3z^2-13z+4 \\ & 3z^2-12z \\ & \pm \quad \mp \\ \hline & -z+4 \\ & -z+4 \\ \hline & 0 \end{array}$$

∴ yes, it is a factor of polynomial.

(V) $2a-3$, $10a^2-9a-5$

Sol:

$$\begin{array}{r|l} 2a-3 & 5a+3 \\ \hline & 10a^2-9a-5 \\ & 10a^2 \mp 15a \\ \hline & 6a-5 \\ & 6a \mp 9 \\ \hline & 4 \end{array}$$

∴ Remainder = 4. No, it is not a factor.

(VI) $4y+1$, $8y^2-2y+1$

$$\begin{array}{r|l} 4y+1 & 2y-1 \\ \hline & 8y^2-2y+1 \\ & 8y^2 \pm 2y \\ \hline & -4y+1 \\ & -4y \mp 1 \\ & \pm \quad \pm \\ \hline & 2 \end{array}$$

∴ Remainder = 2

Hence. It is not a factor.

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