Factorisation of Polynomials Ex 6.3 Q8

Answer :

Let us denote the given polynomials as

$$f(x) = 3x^4 + 2x^3 - \frac{x^2}{3} - \frac{x}{9} + \frac{2}{27},$$

$$g(x) = x + \frac{2}{3}$$

$$\Rightarrow \quad g(x) = x - \left(-\frac{2}{3}\right)$$

We have to find the remainder when $f(x)$ is divided by $g(x)$.

By the remainder theorem, when $f(x)$ is divided by $g(x)$ the remainder is

$$f\left(-\frac{2}{3}\right) = 3\left(-\frac{2}{3}\right)^4 + 2\left(-\frac{2}{3}\right)^3 - \frac{\left(-\frac{2}{3}\right)^2}{3} - \frac{\left(-\frac{2}{3}\right)}{9} + \frac{2}{27}$$

$$= 3 \times \frac{16}{81} - 2 \times \frac{8}{27} - \frac{4}{27} + \frac{2}{27} + \frac{2}{27}$$

$$= \frac{16}{27} - \frac{16}{27} - \frac{4}{27} + \frac{2}{27} + \frac{2}{27}$$

$$= \boxed{0}$$

Remainder by actual division

$$
\begin{array}{r|l}
 & 3x^3 - \frac{x}{3} + \frac{1}{9} \\
\hline
x + \frac{2}{3} & 3x^4 + 2x^3 - \frac{x^2}{3} - \frac{x}{9} + \frac{2}{27} \\
 & 3x^4 + 2x^3 \\
 & - \quad - \\
\hline
 & -\frac{x^2}{3} - \frac{x}{9} + \frac{2}{27} \\
 & -\frac{x^2}{3} - \frac{2x}{9} \\
 & - \quad + \\
\hline
 & \frac{x}{9} + \frac{2}{27} \\
 & \frac{x}{9} + \frac{2}{27} \\
 & - \quad - \\
\hline
 & 0
\end{array}
$$

Remainder is 0

Factorisation of Polynomials Ex 6.3 Q9

Answer :

Let us denote the given polynomials as

$f(x) = 2x^3 + ax^2 + 3x - 5,$

$g(x) = x^3 + x^2 - 4x + a,$

$h(x) = x - 2$

Now, we will find the remainders R_1 and R_2 when $f(x)$ and $g(x)$ respectively are divided by $h(x)$

By the remainder theorem, when $f(x)$ is divided by $h(x)$ the remainder is

$$
\begin{aligned}
R_1 &= f(2) \\
&= 2(2)^3 + a(2)^2 + 3(2) - 5 \\
&= 16 + 4a + 6 - 5 \\
&= 4a + 17
\end{aligned}
$$

By the remainder theorem, when $g(x)$ is divided by $h(x)$ the remainder is

$$
\begin{aligned}
R_2 &= g(2) \\
&= (2)^3 + (2)^2 - 4(2) + a \\
&= 8 + 4 - 8 + a \\
&= a + 4
\end{aligned}
$$

By the given condition, the two remainders are same. Then we have,

$$R_1 = R_2$$

$$\Rightarrow \quad 4a + 17 = a + 4$$

$$\Rightarrow \quad 4a - a = 4 - 17$$

$$\Rightarrow \quad 3a = -13$$

$$\Rightarrow \quad a = \boxed{-\frac{13}{3}}$$

********** END **********