



Using division algorithm, we have

$$f(x) = g(x) \times q(x) + r(x)$$

$$x^5 - 4x^3 + x^2 + 3x + 1 = (x^3 - 3x + 1)(ax^2 + bx + c) + px + q$$

$$x^5 - 4x^3 + x^2 + 3x + 1 = ax^5 - 3ax^3 + ax^2 + bx^4 - 3bx^2 + bx + cx^3 - 3xc + c + px + q$$

$$x^5 - 4x^3 + x^2 + 3x + 1 = ax^5 + bx^4 - 3ax^3 + cx^3 + ax^2 - 3bx^2 + bx - 3xc + px + c + q$$

$$x^5 - 4x^3 + x^2 + 3x + 1 = ax^5 + bx^4 - x^3(3a - c) + x^2(a - 3b) + x(b - 3c + p) + c + q$$

Equating the co-efficient of various powers of x on both sides, we get

On equating the co-efficient of x^5

$$x^5 = ax^5$$

$$\cancel{x^5} = a\cancel{x^5}$$

$$1 = a$$

On equating the co-efficient of x^4

$$bx^4 = 0$$

$$b = \frac{0}{x^4}$$

$$b = 0$$

On equating the co-efficient of x^3

$$3a - c = 4$$

Substituting $a = 1$ we get

$$3 \times 1 - c = 4$$

$$3 - c = 4$$

$$-c = 4 - 3$$

$$-c = 1$$

$$c = -1$$

On equating the co-efficient of x

$$b - 3c + p = 3$$

Substituting $b = 0$ and $c = -1$, we get

$$0 - 3 \times -1 + p = 3$$

$$3 + p = 3$$

$$+p = 3 - 3$$

$$p = 0$$

On equating constant term, we get

$$c + q = 1$$

Substituting $c = -1$, we get

$$-1 + q = 1$$

$$q = 1 + 1$$

$$q = 2$$

Therefore, quotient $q(x) = ax^2 + bx + c$

$$= 1x^2 + 0x - 1$$

$$= x^2 - 1$$

Remainder $r(x) = px + q$

$$= 0 \times x + 2$$

$$= 2$$

Clearly, $r(x) = 2$

Hence, $g(x)$ is not a factor of $f(x)$.

(iii) Given,

$$f(x) = 6x^5 - x^4 + 4x^3 - 5x^2 - x - 15$$

$$g(x) = 2x^2 - x + 3$$

Here, Degree $(f(x)) = 5$ and

Degree $(g(x)) = 2$

Therefore, quotient $q(x)$ is of degree $5 - 2 = 3$ and

Remainder $r(x)$ is of degree less than 1

Let $q(x) = ax^3 + bx^2 + cx + d$ and

$$r(x) = px + q$$

Using division algorithm, we have

$$f(x) = g(x) \times q(x) + r(x)$$

$$6x^5 - x^4 + 4x^3 - 5x^2 - x - 15 = (2x^2 - x + 3)(ax^3 + bx^2 + cx + d) + px + q$$

$$6x^5 - x^4 + 4x^3 - 5x^2 - x - 15 = 2ax^5 - ax^4 + 3ax^3 + 2bx^4 - bx^3 + 3bx^2 + 2cx^3 - cx^2 + 3cx + 2x^2d - dx + 3d + px + q$$

$$6x^5 - x^4 + 4x^3 - 5x^2 - x - 15 = 2ax^5 - ax^4 + 2bx^4 + 3ax^3 - bx^3 + 2cx^3 + 3bx^2 + 2x^2d - cx^2 + 3cx - dx + px + 3d + q$$

$$6x^5 - x^4 + 4x^3 - 5x^2 - x - 15 = 2ax^5 - x^4(a - 2b) + x^3(3a - b + 2c) - x^2(c - 3b - 2d) - x(d - 3c - p) + 3d + q$$

***** END *****