

1st Method :

let y be the given function

$$\text{let } y = 11x^{(4)} + Ax^{(3)} + Bx^{(2)} + Cx^{(1)} + D \quad \text{--- (1)}$$

$$\Rightarrow 11x^4 + 5x^3 + 2x^2 + x - 15 = 11x^{(4)} + Ax^{(3)} + Bx^{(2)} + Cx + D$$

$$\Rightarrow 11x^4 + 5x^3 + 2x^2 + x - 15 = 11x(x-1)(x-2)(x-3) + Ax(x-1)(x-2) + Bx(x-1) + Cx + D$$

Putting $x = 0$
 $-15 = D$

Putting $x = 1$
 $11 + 5 + 2 + 1 - 15 = C + D$
 $\therefore \boxed{C = 19}$

Putting $x = 2$
 $176 + 40 + 8 + 2 - 15 = 2B + 2C + D$
 $\Rightarrow 2B = 176 + 40 + 10 - 38$
 $\Rightarrow 2B = 226 - 8$
 $\therefore \boxed{B = 94}$

Putting $x = 3$
 $891 + 135 + 18 + 3 - 15 = 6A + 6B + 3C + D$
 $\Rightarrow 6A = 891 + 135 + 18 + 3 - 564 - 57$
 $\Rightarrow 6A = 1047 - 621$
 $\therefore \boxed{A = 71}$

\therefore (1) becomes

$$y = 11x^{(4)} + 71x^{(3)} + 94x^{(2)} + 19x^{(1)} - 15$$