let $x^3 - 2x^2 + x - 1 = x^{(3)} + Ax^{(2)} + Bx^{(1)} + C$

$\Rightarrow x^3 - 2x^2 + x - 1 = x(x-1)(x-2) + Ax(x-1) + Bx + C$

Putting $x = 0$

$\therefore \boxed{-1 = C}$

Putting $x = 1$

$1 - 2 + 1 - 1 = B + C$

$\therefore \boxed{B = 0}$

Putting $x = 2$

$8 - 8 + 2 - 1 = 2A + C$

$\therefore \boxed{A = 1}$

$\therefore$ ① becomes

$$y = x^{(3)} + x^{(2)} - 1$$
$$\Delta y = 3x^{(2)} + 2x^{(1)}$$
$$\Delta^2 y = 6x^{(1)} + 2$$
$$\Delta^3 y = 6$$
$$\Delta^4 y = 0$$

proved

7) Express $U = x^4 - 12x^3 + 24x^2 - 30x + 9$ and its Sucessive difference in factorial notation. Hence Show that $\Delta^5 U = 0$.

Ans $\because U = x^4 - 12x^3 + 24x^2 - 30x + 9$.

let $U = x^{(4)} + Ax^{(3)} + Bx^{(2)} + Cx^{(1)} + D$ —— ①

$\Rightarrow x^4 - 12x^3 + 24x^2 - 30x + 9 = x(x-1)(x-2)(x-3) + Ax(x-1)(x-2) + Bx(x-1) + Cx + D$