

Putting  $x=0$   
 $\therefore [9=D]$

Putting  $x=1$   
 $1-12+24-30+9 = C+D$   
 $\therefore [C=-17]$

Putting  $x=2$   
 $16-96+96-60+9 = 2B+2C+D$   
 $-44+34 = 2B$   
 $\therefore [B=-5]$

Putting  $x=3$   
 $81-324+216-90+9 = 6A+6B+3C+D$   
 $117+51+30 = 6A$   
 $\therefore [A=33]$

$\therefore$  ① becomes

$$U = x^{(4)} + 33x^{(3)} - 5x^{(2)} - 17x^{(1)} + 9$$

$$\Delta U = 4x^{(3)} + 99x^{(2)} - 10x^{(1)} - 17$$

$$\Delta^2 U = 12x^{(2)} + 198x^{(1)} - 10$$

$$\Delta^3 U = 24x^{(1)} + 198$$

$$\Delta^4 U = 24$$

$$\Delta^5 U = 0$$

8) Express  $3x^4 - 4x^3 + 6x^2 + 2x + 1$  as a factorial polynomial and find difference of all order.

Ans