

2nd method:

using Synthetic division rule:

$$\text{let } y = x^4 - 12x^2 - 30x + 9$$

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

1	1	0	-12	-30	9 = D
		1	1	-11	
2	1	1	-11	-41 = C	
		2	6		
3	1	3	-5 = B		
		3			
	1	6 = A			

$$\therefore y = x^{(4)} + 6x^{(3)} - 5x^{(2)} - 41x^{(1)} + 9 \quad \checkmark$$

5) find the function whose 2nd difference is $3x^2 + 5x + 3$

s: let y be the function

given $\Delta^2 y = 3x^2 + 5x + 3$ ——— ①

$$\text{let } 3x^2 + 5x + 3 = 3x^{(2)} + Ax^{(1)} + 3$$

$$= 3x(x+1) + Ax + 3$$

Putting $x=1$

$$3 + 5 + 3 = A + 3$$

$$\therefore \boxed{A=8}$$