$\therefore$ ① becomes

$$\Delta^2 y = 3x^{(2)} + 8x^{(1)} + 3$$

$$\therefore y = 3\frac{1}{\Delta^2}x^{(2)} + 8\frac{1}{\Delta^2}x^{(1)} + 3.\frac{1}{\Delta^2}$$

$$= \cancel{3}\frac{1}{\Delta}\frac{x^{(3)}}{\cancel{3}} + \overset{4}{\cancel{8}}\frac{1}{\Delta}\frac{x^{(2)}}{\cancel{2}} + 3\frac{1}{\Delta}x^{(1)}$$

$$= \frac{x^{(4)}}{4} + 4\frac{x^{(3)}}{3} + 3\frac{x^{(2)}}{2}$$

$$= \frac{1}{4}x(x-1)(x-2)(x-3) + \frac{4}{3}x(x-1)(x-2) + \frac{3}{2}x(x-1)$$

$$= \frac{1}{4}\{x^4 - 6x^3 + 11x^2 - 6x\} + \frac{4}{3}\{x^3 - 3x^2 + 2x\} + \frac{3}{2}\{x^2 - x\}$$

$$= \frac{x^4}{4} - \frac{3}{2}x^3 + \frac{11}{4}x^2 - \frac{3}{2}x + \frac{4}{3}x^3 - 4x^2 + \frac{8}{3}x + \frac{3}{2}x^2 - \frac{3}{2}x$$

$$y = \frac{x^4}{4} - \frac{1}{6}x^3 + \frac{1}{4}x^2 - \frac{1}{3}x$$ A

6) Express $x^3 - 2x^2 + x - 1$ into factorial Polynomial. Hence show that $\Delta^4 f(x) = 0$

Ans: let y be the function
given $y = x^3 - 2x^2 + x - 1$ ——— ①