演算子法（またの名を：「ヘヴィサイドそういうとこだぞ」）

hsjoihs

1. 計算

$$\frac{d^2y}{dx^2}+4\frac{dy}{dx}+3y=x^2$$

$$D^2y+4Dy+3y=x^2$$

$$\Big(D^2+4D+3\Big)y=x^2$$

$$(D+1)(D+3)y=x^2$$

$$y=\frac{1}{(D+1)(D+3)}x^2$$

$$y=\frac{1}{2}\left(\frac{1}{D+1}-\frac{1}{D+3}\right)x^2$$

$$\frac{1}{D+1}x^2=\Big(1-D+D^2-D^3+....\Big)x^2=x^2-2x+2$$

$$\frac{1}{1+\dfrac{D}{3}}x^2=\left(1-\frac{D}{3}+\frac{D^2}{9}-\frac{D^3}{27}+....\right)x^2=x^2-\frac{2x}{3}+\frac{2}{9}$$

$$y=\frac{1}{2}\frac{1}{D+1}x^2-\frac{1}{6}\frac{1}{1+\dfrac{D}{3}}x^2=\left(\frac{1}{2}x^2-x+1\right)-\left(\frac{1}{6}x^2-\frac{x}{9}+\frac{1}{27}\right)$$

$$= \frac{1}{3}x^2 - \frac{8x}{9} + \frac{26}{27}$$

2. 検算

$$y'' = \frac{2}{3}$$

$$4y' = \frac{8}{3}x - \frac{32}{9}$$

$$3y = x^2 - \frac{8x}{3} + \frac{26}{9}$$