Calcular $\mathcal{L}\{\ \}$ de La Ecuacion Diferencial :

1) $y'' - 4y' + 4y = t^3\ ,\quad y(0) = 1,\ y'(0) = 0$

$$\underbrace{\mathcal{L}\{y''\}}_{n=2} - 4\underbrace{\mathcal{L}\{y'\}}_{n=1} + 4\mathcal{L}\{y\} = \underbrace{\mathcal{L}\{t^3\}}_{n=3}$$

$$s^2Y(s) - s\underbrace{y(0)}_{1} - \underbrace{y'(0)}_{0} - 4\cdot[sY(s) - \underbrace{y(0)}_{1}] + 4Y(s) = \frac{3!}{s^4}$$

$$Y(s)[s^2 - 4s + 4] = \frac{6}{s^4} + s - 4$$

$$(s-2)(s-2) \qquad \frac{6 + s^5 - 4s^4}{s^4}$$

$$(s-2)^2$$

$$Y(s) = \frac{s^5 - 4s^4 + 6}{s^4(s-2)^2} = \frac{A}{s} + \frac{B}{s^2} + \frac{C}{s^3} + \frac{D}{s^4} + \frac{E}{s-2} + \frac{F}{(s-2)^2}$$

$$Y(s) = \frac{3/4}{s} + \frac{9/8}{s^2} + \frac{3/2}{s^3} + \frac{3/2}{s^4} + \frac{1/4}{s-2} - \frac{13/8}{(s-2)^2} \qquad |\mathcal{L}^{-1}\{\ \}$$

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Calcular $\mathcal{L}\{\ \}$ de La Ecuacion Diferencial :

1) $y'' - 4y' + 4y = t^3\,,\quad y(0) = 1\,, y'(0) = 0$

$$\mathcal{L}^{-1}\{Y(s)\} = \mathcal{L}^{-1}\left\{\frac{3/4}{s}\right\} + \frac{9}{8}\mathcal{L}^{-1}\left\{\frac{1}{s^2}\right\}_{n=1} + \frac{3}{2\cdot 2!}\mathcal{L}^{-1}\left\{\frac{2!}{s^3}\right\}_{n=2} + \frac{3}{2\cdot 3!}\mathcal{L}^{-1}\left\{\frac{3!}{s^4}\right\}_{n=3} + \frac{1}{4}\mathcal{L}^{-1}\left\{\frac{1}{s-2}\right\}_{a=2}$$

$$-\frac{13}{8}\mathcal{L}^{-1}\left\{\frac{1}{(s-2)^2}\right\}_{s-2\to s}$$

$$y(t) = \frac{3}{4} + \frac{9}{8}t + \frac{3}{4}t^2 + \frac{1}{4}t^3 + \frac{1}{4}e^{2t} - \frac{13}{8}e^{2t}\mathcal{L}^{-1}\left\{\frac{1}{s^2}\right\}_{n=1}$$

$$y(t) = \frac{3}{4} + \frac{9}{8}t + \frac{3}{4}t^2 + \frac{1}{4}t^3 + \frac{1}{4}e^{2t} - \frac{13}{8}e^{2t}t$$

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Calcular $\mathcal{L}\{\ \}$ de La Ecuacion Diferencial :

2) $y'' - 2y' + 5y = 1 + t\,,\quad y(0) = 0\,, y'(0) = 4$

$$\mathcal{L}\{y''\} - 2\mathcal{L}\{y'\} + 5\mathcal{L}\{y\} = \mathcal{L}\{1+t\}$$

$n=2 \qquad n=1$

$$s^2Y(s) - s\underbrace{y(0)}_{0} - \underbrace{y'(0)}_{4} - 2[sY(s) - \underbrace{y(0)}_{0}] + 5Y(s) = \frac{1}{s} + \frac{1}{s^2}$$

$$Y(s)[s^2 - 2s + 5] = \frac{1}{s} + \frac{1}{s^2} + 4$$

$s^2 - 2s + 1 - 1 + 5$

$(s-1)^2 + 4$

$$\frac{s + 1 + 4s^2}{s^2}$$

$$Y(s) = \frac{4s^2 + s + 1}{s^2[(s-1)^2 + 4]} = \frac{A}{s} + \frac{B}{s^2} + \frac{Cs + D}{(s-1)^2 + 4}$$

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