Calcular la Tranformada Inversa $\mathcal{L}^{-1}\{F(S)\}$ de :

$$3)\ F(s) = \frac{2S+5}{S^2+6S+34} = \frac{2s+5}{\underbrace{s^2+6s+9}-9+34} = \frac{2s+5}{(\underbrace{s+3})^2+25}$$

$$F(s) = \frac{2(s+3-3)+5}{(s+3)^2+25} = \frac{2(s+3)-6+5}{(s+3)^2+25} = \frac{2(s+3)-1}{(s+3)^2+25}$$

$$F(s) = \frac{2(s+3)}{(s+3)^2+25} - \frac{1}{(s+3)^2+25} \quad \Big| \mathcal{L}^{-1}\{\ \}$$

$$\mathcal{L}^{-1}\{F(s)\} = 2\,\mathcal{L}^{-1}\left\{\frac{s+3}{(s+3)^2+25}\right\}_{s+3\to s} - \mathcal{L}^{-1}\left\{\frac{1}{(s+3)^2+25}\right\}_{s+3\to s}$$

$$f(t) = 2e^{-3t}\,\mathcal{L}^{-1}\left\{\frac{s}{s^2+25}\right\}_{k=5} - \frac{e^{-3t}}{5}\,\mathcal{L}^{-1}\left\{\frac{5}{s^2+25}\right\}_{k=5}$$

$$f(t) = 2e^{-3t}\cos(5t) - \frac{e^{-3t}}{5}\,\text{SEN}(5t)$$

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TRANSFORMADA DE UNA DERIVADA

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- $$\mathcal{L}\{f'(t)\} = \int_0^\infty e^{-st} f'(t)\,dt \quad \left.\begin{matrix} u = e^{-st} & dv = f'(t)\,dt \\ du = -se^{-st}\,dt & v = f(t) \end{matrix}\right.$$

$$\mathcal{L}\{f'(t)\} = e^{-st} f(t) \Big|_0^\infty + s \underbrace{\int_0^\infty e^{-st} f(t)\,dt}_{F(s)}$$

$$\mathcal{L}\{f'(t)\} = \cancel{\frac{f(\infty)}{e^{s(\infty)}}}^{\,0} - f(0) + sF(s) = \boxed{sF(s) - f(0)}$$

- $$\mathcal{L}\{f''(t)\} = \int_0^\infty e^{-st} f''(t)\,dt \quad \left.\begin{matrix} u = e^{-st} & dv = f''(t)\,dt \\ du = -se^{-st}\,dt & v = f'(t) \end{matrix}\right.$$

$$\mathcal{L}\{f''(t)\} = e^{-st} f'(t) \Big|_0^\infty + s \int_0^\infty e^{-st} f'(t)\,dt$$

$$\mathcal{L}\{f''(t)\} = \cancel{\frac{f'(\infty)}{e^{s(\infty)}}}^{\,0} - f'(0) + s\left[sF(s) - f(0)\right]$$

$$\mathcal{L}\{f''(t)\} = s^2 F(s) - sf(0) - f'(0)$$

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$$\mathcal{L}\{f^{(n)}(t)\} = s^{n}F(s) - s^{n-1}f(0) - s^{n-2}f'(0) - s^{n-3}f''(0) - \ldots\ldots$$
$$s^{n-4}f'''(0)$$

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$$\mathcal{L}\{f^{II}(t)\} = s^2 F(s) - s f(0) - \underset{1}{\cancel{s^{0}}} f'(0)$$

$n = 2$

$$\mathcal{L}\{y^{(4)}(t)\} = s^4 Y(s) - s^3 y(0) - s^2 y'(0) - s y''(0) - y'''(0)$$

$n = 4$

$y(a) = b \quad ; \; y'(c) = d$

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