Transformada de Laplace de $f'(t)$

$$\mathcal{L}[f'(t)] = s\mathcal{L}[f(t)] - f(0)$$

$$\mathcal{L}[f'(t)] = \int_0^\infty f'(t)e^{-st}dt$$

$u = e^{-st}$ $\quad dv = f'(t)dt$

$du = -se^{-st}dt$ $\quad v = f(t)$

$$= e^{-st}f(t)\Big|_0^\infty - \int_0^\infty f(t)(-se^{-st})dt$$

$$= \lim_{t\to\infty} e^{-st}f(t) - e^{-s(0)}f(0) + s\int_0^\infty f(t)e^{-st}dt$$

$$= -f(0) + s\mathcal{L}[f(t)]$$ ∴ se cumple para cualquier valor de $-\infty < s < \infty$