

Tabla de propiedades de la Transformada de Laplace

	$\ell[af(t)] = aF(s)$
Linealidad	$\ell[f_1(t) + f_2(t)] = F_1(s) + F_2(s)$
Desplazamiento en el tiempo	$\ell[f(t - \tau)u(t - \tau)] = e^{-s\tau}F(s)$
Impulso	$\ell[\delta(t)] = 1$
Desplazamiento de frecuencia	$\ell[e^{-at}f(t)] = F(s + a)$
Derivada	$\ell\left[\frac{df(t)}{dt}\right] = sF(s) - f(0)$
Integral	$\ell\left[\int_a^t f(t)dt\right] = \frac{F(s)}{s} + \frac{\int_a^t f(t)dt}{s}\Big _{t=0}$

Teorema del valor inicial	$\lim_{t \rightarrow 0} f(t) = \lim_{s \rightarrow \infty} sF(s)$
Teorema del valor final	$\lim_{t \rightarrow \infty} f(t) = \lim_{s \rightarrow 0} sF(s)$
Tiempo por una función	$\ell[tf(t)] = -\frac{dF(s)}{ds}$ donde $F(s) = \ell[f(t)]$
	$\ell[f(at)] = \frac{1}{a}F\left(\frac{s}{a}\right)$
	$\ell[t^n f(t)] = (-1)^n \frac{d^n F(s)}{ds^n}$
	$\ell\left[f\left(\frac{t}{a}\right)\right] = aF(as)$
	$\ell\left[\frac{f(t)}{t}\right] = \int_s^\infty F(s)ds$

Pares de Transformadas de Laplace

$f(t)$		$F(s)$
1	Impulso unitario	1
$u(t)$	Escalón unitario	$\frac{1}{s}$
a	Escalón	$\frac{a}{s}$
at	Rampa	$\frac{a}{s^2}$
e^{-at}	Exponencial	$\frac{1}{s \pm a}$
$\text{sen } \omega t$	Seno	$\frac{\omega}{s^2 + \omega^2}$
$\text{cos } \omega t$	Coseno	$\frac{s}{s^2 + \omega^2}$
$e^{-at} \text{sen } \omega t$	Seno amortiguado	$\frac{\omega}{(s+a)^2 + \omega^2}$
$e^{-at} \text{cos } \omega t$	Coseno amortiguado	$\frac{s+a}{(s+a)^2 + \omega^2}$
t^n		$\frac{n!}{s^{n+1}}$
$t^n e^{-at}$		$\frac{n!}{(s+a)^{n+1}}$
$t \text{cos } \omega t$		$\frac{s^2 - \omega^2}{(s^2 + \omega^2)^2}$
$\frac{t}{2\omega} \text{sen } \omega t$		$\frac{s}{(s^2 + \omega^2)^2}$

$f(t)$		$F(s)$
$\frac{t^{n-1}}{(n-1)!}$		$\frac{1}{s^n}$
$\frac{t^{n-1} e^{-at}}{(n-1)!}$	Rampa amortiguada	$\frac{1}{(s \pm a)^n}$
$\frac{1}{a}(1 - e^{-at})$		$\frac{1}{s(s+a)}$
$\frac{1}{a^2}(at - 1 + e^{-at})$		$\frac{1}{s^2(s+a)}$
$\frac{1}{b-a}(e^{-at} - e^{-bt})$		$\frac{1}{(s+a)(s+b)}$
$\frac{1}{b-a}(be^{-bt} - ae^{-at})$		$\frac{s}{(s+a)(s+b)}$
$\frac{1}{ab}\left[1 + \frac{1}{a-b}(be^{-at} - ae^{-bt})\right]$		$\frac{1}{s(s+a)(s+b)}$
$sh\omega t$		$\frac{\omega}{s^2 - \omega^2}$
$ch\omega t$		$\frac{s}{s^2 - \omega^2}$
$\frac{\omega_n}{\sqrt{1-\xi^2}} e^{-\xi\omega_n t} \text{sen } \omega_n \sqrt{1-\xi^2} t$		$\frac{\omega_n^2}{s^2 + 2\xi\omega_n s + \omega_n^2}$
$-\frac{1}{\sqrt{1-\xi^2}} e^{-\xi\omega_n t} \text{sen}\left(\omega_n \sqrt{1-\xi^2} t - \arctan \frac{\sqrt{1-\xi^2}}{\xi}\right)$		$\frac{s}{s^2 + 2\xi\omega_n s + \omega_n^2}$
$1 - \frac{1}{\sqrt{1-\xi^2}} e^{-\xi\omega_n t} \text{sen}\left(\omega_n \sqrt{1-\xi^2} t + \arctan \frac{\sqrt{1-\xi^2}}{\xi}\right)$		$\frac{\omega_n^2}{s(s^2 + 2\xi\omega_n s + \omega_n^2)}$
$2 K e^{-\alpha t} \text{cos}(\beta t + \theta)$ K es un n° complejo = $ K \underline{\theta}$		$\frac{K}{s + \alpha - \beta j} + \frac{K^*}{s + \alpha + \beta j}$
$2t K e^{-\alpha t} \text{cos}(\beta t + \theta)$ K es un n° complejo = $ K \underline{\theta}$		$\frac{K}{(s + \alpha - \beta j)^2} + \frac{K^*}{(s + \alpha + \beta j)^2}$