

Table of Laplace Transforms and Properties

LAPLACE TRANSFORMS			LAPLACE TRANSFORM PROPERTIES		
	$x(t)$	$X(s)$		Time-domain	s-domain
Unit Impulse	$\delta(t)$	1	Linearity	$\alpha x_1(t) + \beta x_2(t)$	$\alpha X_1(s) + \beta X_2(s)$
Unit Step	$u(t)$	$1/s$	Time shifting	$x(t - t_o)$	$\exp(-st_o) X(s)$
Ramp	$tu(t)$	$1/s^2$	Shifting in the s-domain	$\exp(s_o t)x(t)$	$X(s - s_o)$
n th order Ramp	$t^n u(t)$	$\frac{n!}{s^{n+1}}$	Time scaling	$x(\alpha t)$	$\frac{1}{ \alpha } X\left(\frac{s}{\alpha}\right)$
Damped Ramp	$t \exp(-\alpha t) u(t)$	$1/(s + \alpha)^2$	Integration in the time-domain	$\int_0^t x(\zeta) d\zeta$	$\frac{1}{s} X(s)$
Exponential	$\exp(-\alpha t) u(t)$	$1/(s + \alpha)$	Differentiation in the time-domain	$\frac{dx(t)}{dt}$	$sX(s) - x(0)$
Cosine	$\cos(\omega_o t) u(t)$	$s/(s^2 + \omega_o^2)$		$\frac{d^n x(t)}{dt^n}$	$s^n X(s) - \sum_{k=0}^{n-1} s^{n-1-k} \frac{d^k x(t)}{dt^k} \Big _{t=0}$
Sine	$\sin(\omega_o t) u(t)$	$\omega_o/(s^2 + \omega_o^2)$	Differentiation in the s-domain	$-tx(t)$	$\frac{dX(s)}{ds}$
Damped Cosine	$\exp(-\alpha t) \cos(\omega_o t) u(t)$	$\frac{s + \alpha}{(s + \alpha)^2 + \omega_o^2}$		$(-t)^n x(t)$	$\frac{d^n X(s)}{ds^n}$
Damped Sine	$\exp(-\alpha t) \sin(\omega_o t) u(t)$	$\frac{\omega_o}{(s + \alpha)^2 + \omega_o^2}$	Convolution in the time-domain	$\int_{-\infty}^{\infty} x_1(\zeta) x_2(t - \zeta) d\zeta$	$X_1(s) X_2(s)$
Initial value theorem: $f(0) = \lim_{s \rightarrow \infty} sF(s)$			Final value theorem: $\lim_{t \rightarrow \infty} f(t) = \lim_{s \rightarrow 0} sF(s)$		