

Table of Laplace Transforms

$$\mathcal{L}\{f(t)\} = \int_0^{\infty} e^{-st} f(t) dt = F(s)$$

$f(t)$	$\mathcal{L}\{f(t)\} = F(s)$	$f(t)$	$\mathcal{L}\{f(t)\} = F(s)$
1	$\frac{1}{s}$	e^{at}	$\frac{1}{s-a}$
t^n	$\frac{n!}{s^{n+1}}$	$\frac{e^{at} t^n}{n!}$	$\frac{1}{(s-a)^{n+1}}$
$\sin \omega t$	$\frac{\omega}{s^2 + \omega^2}$	$\cos \omega t$	$\frac{s}{s^2 + \omega^2}$
$e^{at} \sin \omega t$	$\frac{\omega}{(s-a)^2 + \omega^2}$	$e^{at} \cos \omega t$	$\frac{s-a}{(s-a)^2 + \omega^2}$
$t \sin \omega t$	$\frac{2\omega s}{(s^2 + \omega^2)^2}$	$t \cos \omega t$	$\frac{s^2 - \omega^2}{(s^2 + \omega^2)^2}$
$\frac{\sin \omega t - \omega t \cos \omega t}{2\omega^3}$	$\frac{1}{(s^2 + \omega^2)^2}$	$\mathcal{U}(t-a)$	$\frac{e^{-as}}{s}$
$\delta(t)$	1	$\delta(t-a)$	e^{-as}

$$\mathcal{L}\{\alpha f(t) + \beta g(t)\} = \alpha \mathcal{L}\{f(t)\} + \beta \mathcal{L}\{g(t)\}$$

$$\mathcal{L}\{e^{at} f(t)\} = F(s-a) \quad \mathcal{L}\{t^n f(t)\} = (-1)^n \frac{d^n}{ds^n} F(s)$$

$$\mathcal{L}^{-1}\{e^{-as} F(s)\} = f(t-a) \mathcal{U}(t-a) \quad \mathcal{L}\{f(t) \mathcal{U}(t-a)\} = e^{-as} \mathcal{L}\{f(t+a)\}$$

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

$$\mathcal{L}\{f^{(n)}(t)\} = s^n F(s) - s^{n-1} f(0) - \dots - f^{(n-1)}(0)$$

$$f(t) * g(t) = \int_0^t f(\theta) g(t-\theta) d\theta \implies \mathcal{L}\{f(t) * g(t)\} = F(s)G(s)$$

$$\mathcal{L}\left\{\int_0^t f(\theta) d\theta\right\} = \frac{F(s)}{s}$$

$$f(t) \text{ has period } T \implies \mathcal{L}\{f(t)\} = \frac{1}{1 - e^{-sT}} \int_0^T e^{-st} f(t) dt$$