

LAPLACE TRANSFORM TABLE

$f(t) = \mathcal{L}^{-1}\{F(s)\}(t)$	$F(s) = \mathcal{L}\{f(t)\}(s) = \int_0^{\infty} e^{-st} f(t) dt$
1	$\frac{1}{s}, \quad s > 0$
$t^n, \quad n \text{ an integer}$	$\frac{n!}{s^{n+1}}, \quad s > 0$
e^{at}	$\frac{1}{s-a}, \quad s > a$
$\sin bt$	$\frac{b}{s^2 + b^2}, \quad s > 0$
$\cos bt$	$\frac{s}{s^2 + b^2}, \quad s > 0$
$e^{at} f(t)$	$F(s-a)$
$e^{at} t^n, \quad n \text{ an integer}$	$\frac{n!}{(s-a)^{n+1}}, \quad s > a$
$e^{at} \sin bt$	$\frac{b}{(s-a)^2 + b^2}, \quad s > a$
$e^{at} \cos bt$	$\frac{(s-a)}{(s-a)^2 + b^2}, \quad s > a$
$t \sin bt$	$\frac{2bs}{(s^2 + b^2)^2}, \quad s > 0$
$t \cos bt$	$\frac{s^2 - b^2}{(s^2 + b^2)^2}^*, \quad s > 0$
$u_c(t)f(t), \quad c \geq 0$	$e^{-cs} \mathcal{L}\{f(t+c)\}(s)$
$u_c(t)f(t-c), \quad c \geq 0^{**}$	$e^{-cs} \mathcal{L}\{f(t)\}(s)$
$y' = \dot{y} = \frac{dy}{dt}$	$sY(s) - y(0)$
$y'' = \ddot{y} = \frac{d^2y}{dt^2}$	$s^2Y(s) - sy(0) - \dot{y}(0)$

* NB. $\frac{b^2}{(s^2 + b^2)^2} = \frac{1}{s^2 + b^2} - \frac{\frac{1}{2}(s^2 - b^2)}{(s^2 + b^2)^2}$

** Definition: $u_c(t) = \begin{cases} 0 & t < c \\ 1 & t \geq c \end{cases}$ which is also written as $u(t-c)$ or $H(t-c)$