Brief table of Laplace transform

$f(t)$	$F(s) = \mathcal{L}\{f\}(s)$
1	$\frac{1}{s}, \quad s > 0$
e^{at}	$\frac{1}{s-a}, \quad s > a$
$t^n, \quad n = 1, 2, ...$	$\frac{n!}{s^{n+1}}, \quad s > 0$
$\sin bt$	$\frac{b}{s^2+b^2}, \quad s > 0$
$\cos bt$	$\frac{s}{s^2+b^2}, \quad s > 0$
$e^{at}t^n, \quad n = 1, 2, ...$	$\frac{n!}{(s-a)^{n+1}}, \quad s > a$
$e^{at}\sin bt$	$\frac{b}{(s-a)^2+b^2}, \quad s > a$
$e^{at}\cos bt$	$\frac{s-a}{(s-a)^2+b^2}, \quad s > a$
$u_c(t)$	$\frac{e^{-cs}}{s}$
$\delta(t-t_0)$	e^{-st_0}

Properties of Laplace transform

1. $\mathcal{L}\{f+g\} = \mathcal{L}\{f\} + \mathcal{L}\{g\}$
2. $\mathcal{L}\{cf\} = c\mathcal{L}\{f\}$ for any constant c
3. $\mathcal{L}\{e^{at}f(t)\} = F(s-a)$
4. $\mathcal{L}\{f'\} = s\mathcal{L}\{f\} - f(0)$
5. $\mathcal{L}\{f''\} = s^2\mathcal{L}\{f\} - sf(0) - f'(0)$
6. $\mathcal{L}\{f^{(n)}\} = s^n\mathcal{L}\{f\} - s^{n-1}f(0) - s^{n-2}f'(0) - \ldots - f^{(n-1)}(0)$
7. $\mathcal{L}\{t^n f(t)\} = (-1)^n \frac{d^n}{ds^n}(\mathcal{L}\{f(t)\})$
8. $\mathcal{L}\{u_c(t)f(t-c)\} = e^{-cs}\mathcal{L}\{f(t)\} = e^{-cs}F(s)$
9. $u_c(t)f(t-c) = \mathcal{L}^{-1}\{e^{-cs}F(s)\}$, where $f(t) = \mathcal{L}^{-1}\{F(s)\}$

Convolution integrals. If $G(s) = \mathcal{L}\{g(t)\}$ and $H(s) = \mathcal{L}\{h(t)\}$ both exist for $s > a \geq 0$, and

$$F(s) = G(s)H(s), \qquad s > a,$$

then

$$\mathcal{L}^{-1}\{F(s)\} = f(t) = \int_0^t g(t-\tau)h(\tau)d\tau = \int_0^t g(\tau)h(t-\tau)d\tau.$$