

# Laplace Transform Pairs

Item Number	$f(t)$	$\mathcal{L}\{f(t)\}=F(s)$
1	$K\delta(t)$	$K$
2	$Ku(t)$ or $K$	$\frac{K}{s}$
3	$r(t)$	$\frac{1}{s^2}$
4	$t^n u(t)$	$\frac{n!}{s^{n+1}}$
5	$e^{-at} u(t)$	$\frac{1}{s+a}$
6	$te^{-at} u(t)$	$\frac{1}{(s+a)^2}$
7	$t^n e^{-at} u(t)$	$\frac{n!}{(s+a)^{n+1}}$
8	$\sin(\omega t) u(t)$	$\frac{\omega}{s^2 + \omega^2}$
9	$\cos(\omega t) u(t)$	$\frac{s}{s^2 + \omega^2}$
10	$e^{-at} \sin(\omega t) u(t)$	$\frac{\omega}{(s+a)^2 + \omega^2}$
11	$e^{-at} \cos(\omega t) u(t)$	$\frac{s+a}{(s+a)^2 + \omega^2}$
12	$t \sin(\omega t) u(t)$	$\frac{2\omega s}{(s^2 + \omega^2)^2}$
13	$t \cos(\omega t) u(t)$	$\frac{s^2 - \omega^2}{(s^2 + \omega^2)^2}$
14	$\sin(\omega t + \varphi) u(t)$	$\frac{s \sin \varphi + \omega \cos \varphi}{s^2 + \omega^2}$
15	$\cos(\omega t + \varphi) u(t)$	$\frac{s \cos \varphi - \omega \sin \varphi}{s^2 + \omega^2}$
16	$e^{-at} [\sin(\omega t) - \omega t \cos(\omega t)] u(t)$	$\frac{2\omega^3}{[(s+a)^2 + \omega^2]^2}$
17	$te^{-at} \sin(\omega t) u(t)$	$2\omega \frac{s+a}{[(s+a)^2 + \omega^2]^2}$
18	$e^{-at} \left[ C_1 \cos(\omega t) + \left( \frac{C_2 - C_1 a}{\omega} \right) \sin(\omega t) \right] u(t)$	$\frac{C_1 s + C_2}{(s+a)^2 + \omega^2}$
19	$2\sqrt{A^2 + B^2} e^{-at} \cos \left[ \omega t - \tan^{-1} \left( \frac{B}{A} \right) \right] u(t)$	$\frac{A + jB}{s+a+j\omega} + \frac{A - jB}{s+a-j\omega}$
20	$2\sqrt{A^2 + B^2} t e^{-at} \cos \left[ \omega t - \tan^{-1} \left( \frac{B}{A} \right) \right] u(t)$	$\frac{A + jB}{(s+a+j\omega)^2} + \frac{A - jB}{(s+a-j\omega)^2}$