

Table of Laplace Transforms

| $f(t)$ | $\mathcal{L}[f(t)] = F(s)$ | | $f(t)$ | $\mathcal{L}[f(t)] = F(s)$ | |
|------------------------------------|---|------|---|-----------------------------------|------|
| 1 | $\frac{1}{s}$ | (1) | $\frac{ae^{at} - be^{bt}}{a - b}$ | $\frac{s}{(s - a)(s - b)}$ | (19) |
| $e^{at}f(t)$ | $F(s - a)$ | (2) | te^{at} | $\frac{1}{(s - a)^2}$ | (20) |
| $\mathcal{U}(t - a)$ | $\frac{e^{-as}}{s}$ | (3) | $t^n e^{at}$ | $\frac{n!}{(s - a)^{n+1}}$ | (21) |
| $f(t - a)\mathcal{U}(t - a)$ | $e^{-as}F(s)$ | (4) | $e^{at} \sin kt$ | $\frac{k}{(s - a)^2 + k^2}$ | (22) |
| $\delta(t)$ | 1 | (5) | $e^{at} \cos kt$ | $\frac{s - a}{(s - a)^2 + k^2}$ | (23) |
| $\delta(t - t_0)$ | e^{-st_0} | (6) | $e^{at} \sinh kt$ | $\frac{k}{(s - a)^2 - k^2}$ | (24) |
| $t^n f(t)$ | $(-1)^n \frac{d^n F(s)}{ds^n}$ | (7) | $e^{at} \cosh kt$ | $\frac{s - a}{(s - a)^2 - k^2}$ | (25) |
| $f'(t)$ | $sF(s) - f(0)$ | (8) | $t \sin kt$ | $\frac{2ks}{(s^2 + k^2)^2}$ | (26) |
| $f^n(t)$ | $s^n F(s) - s^{(n-1)}f(0) - \dots - f^{(n-1)}(0)$ | (9) | $t \cos kt$ | $\frac{s^2 - k^2}{(s^2 + k^2)^2}$ | (27) |
| $\int_0^t f(x)g(t - x)dx$ | $F(s)G(s)$ | (10) | $t \sinh kt$ | $\frac{2ks}{(s^2 - k^2)^2}$ | (28) |
| $t^n \ (n = 0, 1, 2, \dots)$ | $\frac{n!}{s^{n+1}}$ | (11) | $t \cosh kt$ | $\frac{s^2 + k^2}{(s^2 - k^2)^2}$ | (29) |
| $t^x \ (x \geq -1 \in \mathbb{R})$ | $\frac{\Gamma(x + 1)}{s^{x+1}}$ | (12) | $\frac{\sin at}{t}$ | $\arctan \frac{a}{s}$ | (30) |
| $\sin kt$ | $\frac{k}{s^2 + k^2}$ | (13) | $\frac{1}{\sqrt{\pi t}} e^{-a^2/4t}$ | $\frac{e^{-a\sqrt{s}}}{\sqrt{s}}$ | (31) |
| $\cos kt$ | $\frac{s}{s^2 + k^2}$ | (14) | $\frac{a}{2\sqrt{\pi t^3}} e^{-a^2/4t}$ | $e^{-a\sqrt{s}}$ | (32) |
| e^{at} | $\frac{1}{s - a}$ | (15) | $\operatorname{erfc}\left(\frac{a}{2\sqrt{t}}\right)$ | $\frac{e^{-a\sqrt{s}}}{s}$ | (33) |
| $\sinh kt$ | $\frac{k}{s^2 - k^2}$ | (16) | | | |
| $\cosh kt$ | $\frac{s}{s^2 - k^2}$ | (17) | | | |
| $\frac{e^{at} - e^{bt}}{a - b}$ | $\frac{1}{(s - a)(s - b)}$ | (18) | | | |