Table 2–2 Properties of Laplace Transforms

1	$\mathscr{L}[Af(t)] = AF(s)$
2	$\mathscr{L}[f_1(t) \pm f_2(t)] = F_1(s) \pm F_2(s)$
3	$\mathscr{L}_\pm\left[\frac{d}{dt} f(t)\right] = sF(s) - f(0\pm)$
4	$\mathscr{L}_\pm\left[\frac{d^2}{dt^2} f(t)\right] = s^2F(s) - sf(0\pm) - \dot{f}(0\pm)$
5	$\mathscr{L}_\pm\left[\frac{d^n}{dt^n} f(t)\right] = s^nF(s) - \sum_{k=1}^{n} s^{n-k} \overset{(k-1)}{f}(0\pm)$ where $\overset{(k-1)}{f}(t) = \frac{d^{k-1}}{dt^{k-1}} f(t)$
6	$\mathscr{L}_\pm\left[\int f(t)\,dt\right] = \frac{F(s)}{s} + \frac{1}{s}\left[\int f(t)\,dt\right]_{t=0\pm}$
7	$\mathscr{L}_\pm\left[\int \cdots \int f(t)(dt)^n\right] = \frac{F(s)}{s^n} + \sum_{k=1}^{n} \frac{1}{s^{n-k+1}}\left[\int \cdots \int f(t)(dt)^k\right]_{t=0\pm}$
8	$\mathscr{L}\left[\int_0^t f(t)\,dt\right] = \frac{F(s)}{s}$
9	$\int_0^\infty f(t)\,dt = \lim_{s\to 0} F(s) \quad \text{if } \int_0^\infty f(t)\,dt \text{ exists}$
10	$\mathscr{L}[e^{-at} f(t)] = F(s + a)$
11	$\mathscr{L}[f(t - \alpha)1(t - \alpha)] = e^{-\alpha s}F(s) \quad \alpha \geq 0$
12	$\mathscr{L}[tf(t)] = -\frac{dF(s)}{ds}$
13	$\mathscr{L}[t^2f(t)] = \frac{d^2}{ds^2} F(s)$
14	$\mathscr{L}[t^nf(t)] = (-1)^n \frac{d^n}{ds^n} F(s) \quad n = 1, 2, 3, \ldots$
15	$\mathscr{L}\left[\frac{1}{t} f(t)\right] = \int_s^\infty F(s)\,ds \quad \text{if } \lim_{t\to 0} \frac{1}{t} f(t) \text{ exists}$
16	$\mathscr{L}\left[f\left(\frac{t}{a}\right)\right] = aF(as)$
17	$\mathscr{L}\left[\int_0^t f_1(t - \tau)f_2(\tau)\,d\tau\right] = F_1(s)F_2(s)$
18	$\mathscr{L}[f(t)g(t)] = \frac{1}{2\pi j}\int_{c-j\infty}^{c+j\infty} F(p)G(s - p)\,dp$