

Properties and table of Laplace transforms

$f(t)$	$F(s)$
L1. $f(t)$	$\int_0^{\infty} e^{-st} f(t) dt$
L2. $a f(t) + b g(t)$	$a F(s) + b G(s)$
L3. $f(at)$	$\frac{1}{a} F\left(\frac{s}{a}\right)$ ($a > 0$)
L4. $f(t-T)\theta(t-T) = \begin{cases} f(t-T), & t > T \\ 0, & t < T \end{cases}$ ($T \geq 0$)	$e^{-Ts} F(s)$
L5. $e^{-at} f(t)$	$F(s+a)$
L6. $t^n f(t)$	$(-1)^n F^{(n)}(s)$
L7. $f'(t)$	$s F(s) - f(0^-)$ *
L8. $f''(t)$	$s^2 F(s) - s f(0^-) - f'(0^-)$
L9. $f^{(n)}(t)$	$s^n F(s) - \sum_{k=1}^n s^{n-k} f^{(k-1)}(0^-)$
L10. $\int_0^t f(\tau) d\tau$	$\frac{F(s)}{s}$
L11. $\int_0^t \frac{(t-\tau)^{n-1}}{(n-1)!} f(\tau) d\tau$	$\frac{F(s)}{s^n}$
L12. $\begin{cases} \int_{-\infty}^{\infty} f(\tau) g(t-\tau) d\tau & (f(t), g(t) = 0, t < 0) \\ \int_0^t f(\tau) g(t-\tau) d\tau \end{cases}$	$F(s) G(s)$
L13. $\frac{1}{t} f(t)$	$\int_s^{\infty} F(u) du$
L14. $f(t+T) = f(t)$ (periodic)	$(1 - e^{-Ts})^{-1} \int_0^T e^{-st} f(t) dt$
L15. $\delta(t)$	1
L16. $\delta(t-T)$	e^{-Ts} ($T \geq 0$)
L17. $\delta^{(n)}(t)$	s^n
L18. $1, \theta(t) = H(t)$	$\frac{1}{s}$

* In some texts this reads $s F(s) - f(0^+)$ if impulse functions are not considered.

$f(t)$	$F(s)$
L19. $\theta(t-T)$	$\frac{e^{-Ts}}{s}$ ($T \geq 0$)
L20. t^n	$\frac{n!}{s^{n+1}}$ ($n = 0, 1, 2, \dots$)
L21. e^{-at}	$\frac{1}{s+a}$
L22. $t^n e^{-at}$	$\frac{n!}{(s+a)^{n+1}}$ ($n = 0, 1, 2, \dots$)
L23. $(1-ab)e^{-at}$	$\frac{s}{(s+a)^2}$
L24. $\sin at$	$\frac{a}{s^2+a^2}$
L25. $\cos at$	$\frac{s}{s^2+a^2}$
L26. $\sinh at$	$\frac{a}{s^2-a^2}$
L27. $\cosh at$	$\frac{s}{s^2-a^2}$
L28. $\frac{-e^{-at} + e^{-bt}}{a-b}$	$\frac{1}{(s+a)(s+b)}$
L29. $\frac{ae^{-at} - be^{-bt}}{a-b}$	$\frac{s}{(s+a)(s+b)}$
L30. $\frac{(c-b)e^{-at} + (a-c)e^{-bt} + (b-a)e^{-ct}}{(a-b)(b-c)(c-a)}$	$\frac{1}{(s+a)(s+b)(s+c)}$
L31. $\frac{-a(c-b)e^{-at} - b(a-c)e^{-bt} - c(b-a)e^{-ct}}{(a-b)(b-c)(c-a)}$	$\frac{s}{(s+a)(s+b)(s+c)}$
L32. $\frac{a^2(c-b)e^{-at} + b^2(a-c)e^{-bt} + c^2(b-a)e^{-ct}}{(a-b)(b-c)(c-a)}$	$\frac{s^2}{(s+a)(s+b)(s+c)}$
L33. $\frac{e^{-at} - e^{-bt} + (a-b)te^{-bt}}{(a-b)^2}$	$\frac{1}{(s+a)(s+b)^2}$