Table of Laplace Transforms

	$y = f(t),\ t > 0$ $[y = f(t) = 0,\ t < 0]$	$Y = L(y) = F(p) = \int_0^\infty e^{-pt} f(t)\, dt$	
L1	1	$\dfrac{1}{p}$	$\text{Re } p > 0$
L2	e^{-at}	$\dfrac{1}{p+a}$	$\text{Re } (p+a) > 0$
L3	$\sin at$	$\dfrac{a}{p^2+a^2}$	$\text{Re } p > \lvert \text{Im } a \rvert$
L4	$\cos at$	$\dfrac{p}{p^2+a^2}$	$\text{Re } p > \lvert \text{Im } a \rvert$
L5	$t^k,\ k > -1$	$\dfrac{k!}{p^{k+1}}$ or $\dfrac{\Gamma(k+1)}{p^{k+1}}$	$\text{Re } p > 0$
L6	$t^k e^{-at},\ k > -1$	$\dfrac{k!}{(p+a)^{k+1}}$ or $\dfrac{\Gamma(k+1)}{(p+a)^{k+1}}$	$\text{Re } (p+a) > 0$
L7	$\dfrac{e^{-at} - e^{-bt}}{b-a}$	$\dfrac{1}{(p+a)(p+b)}$	$\text{Re } (p+a) > 0$ $\text{Re } (p+b) > 0$
L8	$\dfrac{ae^{-at} - be^{-bt}}{a-b}$	$\dfrac{p}{(p+a)(p+b)}$	$\text{Re } (p+a) > 0$ $\text{Re } (p+b) > 0$
L9	$\sinh at$	$\dfrac{a}{p^2-a^2}$	$\text{Re } p > \lvert \text{Re } a \rvert$
L10	$\cosh at$	$\dfrac{p}{p^2-a^2}$	$\text{Re } p > \lvert \text{Re } a \rvert$
L11	$t \sin at$	$\dfrac{2ap}{(p^2+a^2)^2}$	$\text{Re } p > \lvert \text{Im } a \rvert$
L12	$t \cos at$	$\dfrac{p^2-a^2}{(p^2+a^2)^2}$	$\text{Re } p > \lvert \text{Im } a \rvert$
L13	$e^{-at} \sin bt$	$\dfrac{b}{(p+a)^2+b^2}$	$\text{Re } (p+a) > \lvert \text{Im } b \rvert$
L14	$e^{-at} \cos bt$	$\dfrac{p+a}{(p+a)^2+b^2}$	$\text{Re } (p+a) > \lvert \text{Im } b \rvert$
L15	$1 - \cos at$	$\dfrac{a^2}{p(p^2+a^2)}$	$\text{Re } p > \lvert \text{Im } a \rvert$
L16	$at - \sin at$	$\dfrac{a^3}{p^2(p^2+a^2)}$	$\text{Re } p > \lvert \text{Im } a \rvert$
L17	$\sin at - at \cos at$	$\dfrac{2a^3}{(p^2+a^2)^2}$	$\text{Re } p > \lvert \text{Im } a \rvert$

Table of Laplace Transforms (continued)

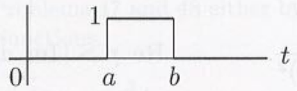
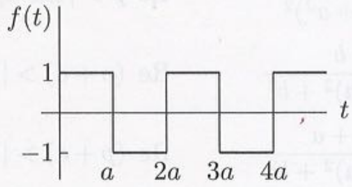
	$y = f(t),\ t > 0$ $[y = f(t) = 0,\ t < 0]$	$Y = L(y) = F(p) = \int_0^\infty e^{-pt} f(t)\,dt$	
L18	$e^{-at}(1 - at)$	$\dfrac{p}{(p+a)^2}$	Re $(p + a) > 0$
L19	$\dfrac{\sin at}{t}$	$\arctan \dfrac{a}{p}$	Re $p > \lvert \text{Im } a \rvert$
L20	$\dfrac{1}{t} \sin at \cos bt,$ $a > 0,\ b > 0$	$\dfrac{1}{2}\left(\arctan \dfrac{a+b}{p} + \arctan \dfrac{a-b}{p}\right)$	Re $p > 0$
L21	$\dfrac{e^{-at} - e^{-bt}}{t}$	$\ln \dfrac{p+b}{p+a}$	Re $(p + a) > 0$ Re $(p + b) > 0$
L22	$1 - \text{erf}\left(\dfrac{a}{2\sqrt{t}}\right),\quad a > 0$ (See Chapter 11, Section 9)	$\dfrac{1}{p}\, e^{-a\sqrt{p}}$	Re $p > 0$
L23	$J_0(at)$ (See Chapter 12, Section 12)	$(p^2 + a^2)^{-1/2}$	Re $p > \lvert \text{Im } a \rvert$; or Re $p \geq 0$ for real $a \neq 0$
L24	$u(t - a) = \begin{cases} 1, & t > a > 0 \\ 0, & t < a \end{cases}$ (unit step, or Heaviside function)	$\dfrac{1}{p}\, e^{-pa}$	Re $p > 0$
L25	$f(t) = u(t - a) - u(t - b)$ 	$\dfrac{e^{-ap} - e^{-bp}}{p}$	All p
L26		$\dfrac{1}{p} \tanh\left(\tfrac{1}{2} ap\right)$	Re $p > 0$
L27	$\delta(t - a),\ a \geq 0$ (See Section 11)	e^{-pa}	
L28	$f(t) = \begin{cases} g(t - a), & t > a > 0 \\ 0, & t < a \end{cases}$ $= g(t - a)u(t - a)$	$e^{-pa} G(p)$ [$G(p)$ means $L(g)$.]	
L29	$e^{-at} g(t)$	$G(p + a)$	

Table of Laplace Transforms (continued)

	$y = f(t),\ t > 0$ $[y = f(t) = 0,\ t < 0]$	$Y = L(y) = F(p) = \int_0^\infty e^{-pt} f(t)\,dt$
L30	$g(at),\ a > 0$	$\frac{1}{a} G\left(\frac{p}{a}\right)$
L31	$\frac{g(t)}{t}$ (if integrable)	$\int_p^\infty G(u)\,du$
L32	$t^n g(t)$	$(-1)^n \frac{d^n G(p)}{dp^n}$
L33	$\int_0^t g(\tau)\,d\tau$	$\frac{1}{p} G(p)$
L34	$\int_0^t g(t-\tau)h(\tau)\,d\tau = \int_0^t g(\tau)h(t-\tau)\,d\tau$ (convolution of g and h, often written as $g * h$; see Section 10)	$G(p)H(p)$
L35	Transforms of derivatives of y (see Section 9): $L(y') = pY - y_0$ $L(y'') = p^2 Y - py_0 - y_0'$ $L(y''') = p^3 Y - p^2 y_0 - py_0' - y_0''$, etc. $L(y^{(n)}) = p^n Y - p^{n-1} y_0 - p^{n-2} y_0' - \cdots y_0^{(n-1)}$	