

Table 3.1 Basic properties of one-sided Laplace transforms		
Causal functions and constants	$\alpha f(t), \beta g(t)$	$\alpha F(s), \beta G(s)$
Linearity	$\alpha f(t) + \beta g(t)$	$\alpha F(s) + \beta G(s)$
Time-shifting	$f(t - \alpha)u(t - \alpha)$	$e^{-\alpha s} F(s)$
Frequency shifting	$e^{\alpha t} f(t)$	$F(s - \alpha)$
Multiplication by t	$t f(t)$	$-\frac{dF(s)}{ds}$
Derivative	$\frac{df(t)}{dt}$	$sF(s) - f(0-)$
Second derivative	$\frac{d^2 f(t)}{dt^2}$	$s^2 F(s) - sf(0-) - f^{(1)}(0)$
Integral	$\int_{0-}^t f(t')dt'$	$\frac{F(s)}{s}$
Expansion/contraction	$f(\alpha t), \alpha \neq 0$	$\frac{1}{ \alpha } F\left(\frac{s}{\alpha}\right)$
Initial value	$f(0-) = \lim_{s \rightarrow \infty} sF(s)$	
Derivative Duality	$\frac{df(t)}{dt}$	$sF(s)$
	$tf(t)$	$-\frac{dF(s)}{ds}$
Integration Duality	$\int_{0-}^t f(\tau)d\tau$	$F(s)/s$
	$f(t)/t$	$\int_{-\infty}^{-s} F(-\rho)d\rho$
Time and Frequency Duality	$f(t - \alpha)u(t - \alpha)$	$F(s)e^{-\alpha s}$
	$f(t)e^{-\alpha t}u(t)$	$F(s + \alpha)$
Time Scaling Duality	$f(\alpha t)u(t)$	$(1/ \alpha)F(s/\alpha)$
	$(1/ \alpha)f(t/\alpha)u(t)$	$F(\alpha s)$
Convolution	$[f * g](t)$	$F(s)G(s)$
Initial value	$f(0-) = \lim_{s \rightarrow \infty} sF(s)$	