

## Laplace Transforms for Math 221

Functions		Rules	
$f(t)$	$\mathcal{L}\{f\}(s)$	$f(t)$	$\mathcal{L}\{f\}(s)$
1	$\frac{1}{s}$	$f + g$	$\mathcal{L}\{f\} + \mathcal{L}\{g\}$
$e^{at}$	$\frac{1}{s-a}, \quad (s > a)$	$cf$	$c\mathcal{L}\{f\}, \quad (c \text{ real})$
$t^n$	$\frac{n!}{s^{n+1}}, \quad (s > 0)$	$e^{at}f(t)$	$\mathcal{L}\{f\}(s-a)$
$\sin(bt)$	$\frac{b}{s^2 + b^2}$	$\frac{df}{dt}$	$s\mathcal{L}\{f\} - f(0)$
$\cos(bt)$	$\frac{s}{s^2 + b^2}$	$\frac{d^2f}{dt^2}$	$s^2\mathcal{L}\{f\} - sf(0) - f'(0)$
$e^{at}t^n$	$\frac{n!}{(s-a)^{n+1}}$	$f^{(n)}$	$s^n\mathcal{L}\{f\} - s^{n-1}f(0) - s^{n-2}f'(0) - \dots - f^{(n-1)}(0)$
$e^{at}\sin(bt)$	$\frac{b}{(s-a)^2 + b^2}$	$tf(t)$	$-\frac{d}{ds}(\mathcal{L}\{f\}(s))$
$e^{at}\cos(bt)$	$\frac{s-a}{(s-a)^2 + b^2}$	$t^n f(t)$	$(-1)^n \frac{d^n}{ds^n}(\mathcal{L}\{f\}(s))$
$u(t-a)$	$\frac{e^{-as}}{s}, \quad (s > 0)$	$u(t-a)f(t)$	$e^{-as}\mathcal{L}\{f(t+a)\}$
$\delta(t-a)$	$e^{-as}$	$u(t-a)f(t-a)$	$e^{-as}\mathcal{L}\{f\}$