

TABLE 9.1\*\*\*

## Laplace Transforms

Exam #:

	$f(t) = \mathcal{L}^{-1}\{F(s)\}$	$F(s) = \mathcal{L}\{f(t)\}$
1	1	$\frac{1}{s}$
2	$e^{at}$	$\frac{1}{s-a}$
3	$\sin(bt)$	$\frac{b}{s^2+b^2}$
4	$\cos(bt)$	$\frac{s}{s^2+b^2}$
5	$\sinh(bt)$	$\frac{b}{s^2-b^2}$
6	$\cosh(bt)$	$\frac{s}{s^2-b^2}$
7	$t^n$ for $n = 1, 2, 3, \dots$	$\frac{n!}{s^{n+1}}$
8	$t^n e^{at}$ for $n = 1, 2, 3, \dots$	$\frac{n!}{(s-a)^{n+1}}$
9	$t \sin(bt)$	$\frac{2bs}{(s^2+b^2)^2}$
10	$t \cos(bt)$	$\frac{s^2-b^2}{(s^2+b^2)^2}$
11	$e^{-at} \sin(bt)$	$\frac{b}{(s+a)^2+b^2}$
12	$e^{-at} \cos(bt)$	$\frac{s+a}{(s+a)^2+b^2}$
13	$\frac{\sin(bt) - bt \cos(bt)}{2b^3}$	$\frac{1}{(s^2+b^2)^2}$
14	$\frac{t \sin(bt)}{2b}$	$\frac{s}{(s^2+b^2)^2}$
15	$u_a(t)$	$\frac{e^{-as}}{s}$
16	$u_a(t)f(t-a)$	$e^{-as}F(s)$
17	$t^\alpha$ , for $\alpha > -1$	$\frac{\Gamma(\alpha+1)}{s^{\alpha+1}}$ , for $s > 0$

Note:  $\Gamma(x) = \int_0^\infty e^{-u} u^{x-1} du$  for  $x > 0$ .

For  $x > -1$ ,  $\Gamma(x+1) = x \cdot \Gamma(x)$ , and  $\Gamma(1) = 1$ . So  $\Gamma(n+1) = n!$ .