

VANDERBILT UNIVERSITY
MATH 196 — LIST OF FORMULAS

These are the formulas that will be given in the final exam.

The table below indicates the Laplace transform $F(s)$ of the given function $f(t)$.

$f(t)$	$F(s)$
1	$\frac{1}{s}$
t	$\frac{1}{s^2}$
t^n	$\frac{n!}{s^{n+1}}$
e^{at}	$\frac{1}{s-a}$
$t^n e^{at}$	$\frac{n!}{(s-a)^{n+1}}$
$\cos(kt)$	$\frac{s}{s^2+k^2}$
$\sin(kt)$	$\frac{k}{s^2+k^2}$
$e^{at} \cos(kt)$	$\frac{s-a}{(s-a)^2+k^2}$
$e^{at} \sin(kt)$	$\frac{k}{(s-a)^2+k^2}$

The following are the main properties of the Laplace transform.

$af(t) + bg(t)$	$aF(s) + bG(s)$
$f'(t)$	$sF(s) - f(0)$
f''	$s^2F(s) - sf(0) - f'(0)$
$f^{(n)}(t)$	$s^n F(s) - s^{n-1}f(0) - \dots - f^{(n-1)}(0)$
$(f * g)(t)$	$F(s)G(s)$
$u(t-a)f(t-a)$	$e^{-as}F(s)$

Above, $u(t-a)$ is given by

$$u(t-a) = \begin{cases} 0, & t \leq a, \\ 1, & t > a. \end{cases}$$

The particular solution of

$$y'' + p(t)y' + q(t)y = f(t)$$

is

$$y_p(t) = -y_1(t) \int \frac{y_2(t)f(t)}{W(t)} dt + y_2(t) \int \frac{y_1(t)f(t)}{W(t)} dt,$$

where $y_1(t)$ and $y_2(t)$ are linearly independent solutions of the associated homogeneous problem and $W(t)$ is the Wronskian of $y_1(t)$ and $y_2(t)$.