Laplace Transform

$f(t),\ t \geq 0$	$F(s) = L(f)(s)$
e^{at}	$1/(s-a),\ s > a$
t^n	$n!/s^{n+1},\ s > 0$
$\sin bt$	$b/(s^2+b^2),\ s > 0$
$\cos bt$	$s/(s^2+b^2),\ s > 0$
$u_a(t),\ a > 0$	$e^{-as}/s,\ s > 0$
$\delta_a(t),\ a > 0$	$e^{-as},\ s > 0$
$f_1(t) + f_2(t)$	$F_1(s) + F_2(s)$
$cf(t)$	$cF(s)$
$f(at)$	$a^{-1}F(s/a)$
$f'(t)$	$sF(s) - f(0)$
$f''(t)$	$s^2F(s) - sf(0) - f'(0)$
$f^{(n)}(t)$	$s^nF(s) - s^{n-1}f(0) - \ldots - f^{(n-1)}(0)$
$e^{at}f(t)$	$F(s-a)$
$t^nf(t)$	$(-1)^n(d^n/ds^n)F(s)$
$f_1 \star f_2$ (convolution)	F_1F_2 (usual product)

Partial fractions

1. Let $p(s)/q(s)$ be a rational function. If $\deg p < \deg q$ go to the next step. If $\deg p \geq \deg q$, divide with a remainder to obtain $p(s)/q(s) = h(s) + r(s)/q(s)$, where h is a polynomial and $\deg r < \deg q$. Then do the next step on $r(s)/q(s)$.

2. Factor the denominator $q(s)$. If you are working over complex numbers, all factors should be of degree 1, if over real numbers, all factors have to be of degree 1 or 2. Go to step 3 or 3′.

3. To each factor $(s-a)^n$ in the denominator correspond the following partial fractions

$$\frac{A_1}{s-a} + \frac{A_2}{(s-a)^2} + \ldots + \frac{A_n}{(s-a)^n}.$$

If you are working over complex numbers, this is enough. Write the partial fractions with undetermined coefficients A_j and then find these coefficients by solving a system of linear equations.

3′. Over the real numbers, to each quadratic factor to the form $(s^2+bs+c)^n$ corresponds a sum of partial fractions of the form

$$\frac{A_1s+B_1}{s^2+bs+c} + \frac{A_2s+B_2}{(s^2+bs+c)^2} + \ldots + \frac{A_ns+B_n}{(s^2+bs+c)^n}.$$