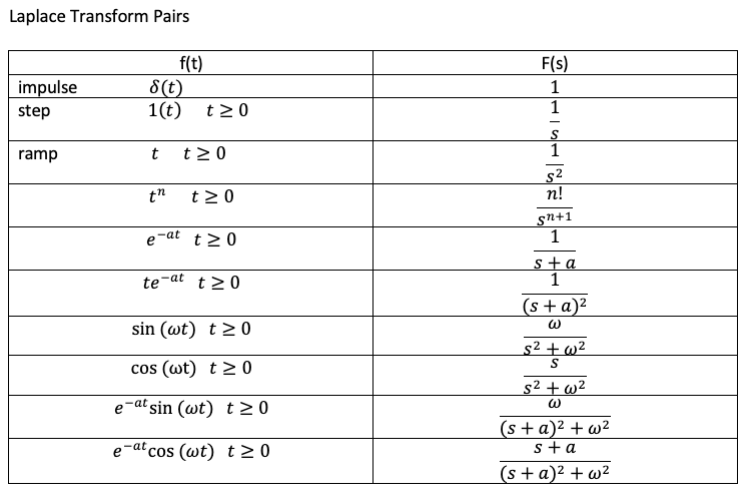
**Laplace Transforms**

Additional methods of solution are the Fourrier, sin, cos, and Laplace transforms, as well as the finite sin and cos transforms. Carefull attention to the existence of integrals and to convergence must be given. These only work when exponentials are solutions to the homogeneous ODE. In effect, transform methods are just special cases of eigenfunction expansions, which are discussed elsewhere. This method takes direct account of the BV or IC. Consider the Laplace Transform. It and its inverse are given below.



Here’s a table:



We’ve got some general properties too, like:



And,



We have the transform of a derivative:



And could go on to work out transform of nth derivative:



Got a convolution:



**Example**

Let’s do:



So,



Now we want to put in form of partial fractions I think. So we’ll say:



and now we’ll work out the partial fraction decomposition by judiciously choosing which s to evaluate the decomposition at:



So,



Now we can do the inverse transform:



**Example**

Let’s do the same guy using the convolution:



Taking Laplace transform,



Now we’ll do the partial fraction decomposition:



So we can write:



and let’s get the inverse Laplace transform of that bracket:



Perfect. So now we have:



Hopefully that’s the same thing.

**Example**

We can use the convolution to construct a GF solution:



Taking Laplace transform,



Now we’ll do the partial fraction decomposition:



So we can write:



and let’s get the inverse Laplace transform of that bracket:



Perfect. So now we have:

