FMSS: Lecture 1 handout

Laplace transform and inverse transform

The Laplace transform is defined for a function $f(t)$ of time that is zero at any $t < 0$.

We take Laplace transforms and inverse Laplace transforms of functions by matching them with entries in the table provided, which have already been calculated from first principles.

$$f(t) \xrightarrow{\mathcal{L}} \bar{f}(s)$$

$$f(t) \xleftarrow[\mathcal{L}^{-1}]{} \bar{f}(s)$$

Linearity

If $f(t)$ and $g(t)$ are time-dependent functions, and a and b are constants:

$$\mathcal{L}\{af(t) + bg(t)\} = a\mathcal{L}\{f(t)\} + b\mathcal{L}\{g(t)\}$$

Discontinuity

A function $f(x)$ is discontinuous at a point if there is a break/jump in the graph at that point.

Unit step function / Heaviside step function

$$U(t) = \begin{cases} 0 & \text{if } t < 0 \\ 1 & \text{if } t > 0 \end{cases}$$