Chapter 1

Introduction

The Laplace transform is a mathematical tool that turns time-based functions into frequency-based functions, making it easier to solve complex problems in engineering and physics. It helps us understand how systems behave over time by looking at their frequency components.
Basically laplace transform allows to write differential equations in form of a algebraic equation.

1.1 Principle Formula

If we want to find the LT of any equation for example $F(t)$ we can find it using the following formula:

$$L\left\{L(t)\right\} = \int_0^\infty F(t)e^{-st}dt = f(s)$$

Hence we can summarize

Let $F(t)$ be a function of t specified for $t > 0$ then the laplace transform of $F(t)$ is defined by $L\left\{L(t)\right\} = \int_0^\infty F(t)e^{-st}dt = f(s)$

1.2 Basic Formulas

The following formulas can be memorized without any hesitations.

1. $L\{1\} = \frac{1}{s}$
2. $L\{t\} = \frac{1}{s^2}$
3. $L\{t^n\} = \frac{n!}{s^{n+1}}$
4. $L\{\sin at\} = \frac{a}{s^2+a^2}$
5. $L\{\cos at\} = \frac{s}{s^2+a^2}$
6. $L\{\sinh at\} = \frac{a}{s^2-a^2}$
7. $L\{\cosh at\} = \frac{s}{s^2-a^2}$