

Section 6.2 Solution of initial value problems.

To solve an initial value problem:

- Take the Laplace transform of both sides of the equation.
- Use the properties of the Laplace transform and the initial conditions to obtain an equation for the Laplace transform of the solution and then solve this equation for the transform.
- Determine the inverse Laplace transform of the solution.

Important formulas:

$$\begin{aligned}\mathcal{L}\{y'\}(s) &= s\mathcal{L}\{y\}(s) - y(0) \\ \mathcal{L}\{y''\}(s) &= s^2\mathcal{L}\{y\}(s) - sy(0) - y'(0)\end{aligned}$$

Example 1. Solve the initial value problem

$$y'' + 6y' + 5y = 12e^t, \quad y(0) = -1, \quad y'(0) = 7.$$