
Lab 9 - Solving Differential Equations by Laplace Transforms

1. Solve the following differential equations using Laplace transforms, where the function is subject to the given conditions.

$$y'' - 2y' + y = e^{2t}, \quad y(0) = 1, y'(0) = 3$$

2. Recall: The impressed voltage in an electric circuit equals the sum of the voltages across the components of the circuit. For a circuit with a resistance R (in ohms), an inductance L (in henrys), a capacitance C (in farads), and a voltage source E (in volts), we have

$$L \frac{d^2 q}{dt^2} + R \frac{dq}{dt} + \frac{q}{C} = E$$

where q represents the electric charge (in coulombs) and t represents the time (in seconds).

A 50Ω resistor, a $400 \mu F$ capacitor, and an $8 V$ battery are connected in series. Find the charge on the capacitor as a function of time t if the initial charge is zero.