

Second Exam
Tuesday, November 5

This exam is open book, computer on. Make sure your name is on all pages, and put your name in a text cell on any Mathematica notebooks before you print them.

1. Solve the following initial value problems by hand. Show all steps.

(a) $y'' + 6y' + 5y = 0, y(0) = 1, y'(0) = 0.$ (b) $y'' + 2y' + y = 0, y(0) = 0, y'(0) = 1.$

(c) $y'' + y' + 2y = 0, y(0) = 1, y'(0) = 0.$ (d) $y'' + 6y' + 5y = \sin(2t), y(0) = 1, y'(0) = 0.$

2. Check your above solutions by using `DSolve` from Mathematica.

3. An electrical circuit has a coil with induction 100 henries, a capacitor with 100 microfarads (that is, with 10^{-4} farads), and a variable resistor with, say R ohms connected in series.

(a) Determine the critical value of the resistance R , that is, the value of R for which the response of the circuit changes from oscillation to non-oscillation.

(b) Determine the value of R for which the quasi-period of the circuit is $1/60$.