Differential Equations: Project 5

Due: Monday, 8 July 2013

Instructions: Complete all problems in a neat and organized fashion on your own paper. If you use Wolfram|Alpha, a calculator, or any other resources, please state what you used it for. You will not lose any points for doing so, as long as you're honest about how and why you used it.

1. Find the solution to the initial value problem

$$2y'' - 3y' + y = 0, \quad y(0) = 2, \quad y'(0) = \tfrac{1}{2}.$$

Then find the maximum value of the solution, and the point where the solution is zero.

2. Consider the equation $ay'' + by' + cy = 0$, where a, b, and c are real constants with $a > 0$. Find conditions on a, b, and c such that the roots of the characteristic equation are:

  a.) real, different, and negative,

  b.) real with opposite signs,

  c.) real, different, and positive,

  d.) real and equal,

  e.) complex conjugates.

3. Use Euler's formula to write the expressions in the form $+i\mu$:

  a.) $e^{2-(\pi/2)i}$

  b.) 2^{1-i}

4. Find the solution to the IVP

$$3u'' - u' + 2u = 0, \quad u(0) = 2, \quad u'(0) = 0.$$

For $t > 0$, find the first time at which $|u(t)| = 10$.