

# Worksheet 18

## April 11th, 2008

1. Interpret the differential equation  $y'' + 2y' + 2y = 0$  in terms of a mass spring system. Using the initial values  $y(0) = 1$  and  $y'(0) = 2$ , find the solution and give a reasonable estimate for when  $|y'(t)| \leq 0.1$ .
2. Solve the following differential equation:

$$y'' - 2y' + y = x^2 - 3x + 1$$

3. What about this one?

$$y'' - 2y' + y = x^2 e^{-x}$$

4. Suppose you had a spring with spring constant  $k$ , and you attached a block of mass  $m$  to it, and let it hang vertically, with the mass dangling down from the spring. If you started the block out 1 meter above the spring's uncompressed state, initially at rest, find the function which describes the behavior of the string.
5.  $u = (\sqrt{a}, \sqrt{b}), v = (\sqrt{b}, \sqrt{a})$ . Compare the geometric mean with the arithmetic mean using Cauchy-Schwarz (Section 6.7).