

Worksheet 17
April 9th, 2008

1 Differential Equations

1. Find the solution to the boundary value problem:

$$y'' - 3y' + 2y = 0$$
$$\begin{cases} y(0) = 0 \\ y(1) = e \end{cases}$$

2. A particle of mass 1 lies along a line in one dimension. The force on the particle at any given moment is equal to twice its distance from the origin plus its current speed. Can you determine for what initial positions and speeds will the particle not shoot off to infinity?
3. We know that the differential equation

$$ay'' + by' + cy = 0; y(t_0) = y_0, y'(t_0) = y_1$$

has a unique solution from the section. Explain why

$$ay'' + by' + cy = 0; y(t_0) = y_0, y(t_1) = y_1, t_1 \neq t_0$$

also has a unique solution. (Update: Not true. If I add the assumption that the characteristic equation has real roots, then it holds.)

4. Interpret the differential equation $y'' + 2y' + 2y = 0$ in terms of a mass spring system. Then find the general solution $y(t)$.