

## Math 250b (Spring '08) - Homework 8

1. Consider the second order differential equation:

$$\frac{d^2x}{dt^2} + \lambda^2 \sinh(x) = 0$$

- (a) Find the first order system that corresponds to this second order equation.
- (b) Use the computer program to plot the phase phase for your first order system. Are there any unbounded solutions? Are there any periodic solutions? Are there any solutions which remain bounded but are not periodic?
- (c) You cannot solve this equation explicitly, but we can find an explicit equation for the trajectories in the phase plane. Use the first order system to find a differential equation for  $\frac{dy}{dx}$ . Solve it to find the trajectories.