

4. [15 points] Consider the homogeneous problem  $L[y] = my'' + \gamma y' + ky = 0$ .
- a. [5 points] If this models critically damped harmonic motion, find the general solution to the problem.
- b. [5 points] Sketch a phase portrait for the system for the case when this represents critically damped harmonic motion.
- c. [5 points] Suppose that we decrease  $\gamma$  in our equation very slightly from the critically damped case we considered in (a) and (b). Sketch the phase portrait for the new system. Why does it change as it does? What type of damping are we seeing now?