A Spring-Mass System[1]

1. Type the following commands (at the prompt and then press Enter):
   (a) `syms a`
   (b) `y = dsolve('2*D2y+.5*Dy+5*y=sin(a*t)','y(0)=1','Dy(0)=1')`
   (c) `y1 = subs(y, a, 1)` ..... Substitutes "1" for `a`.
   (d) `ezplot(y1, [0,50])`
   (e) Explain exactly what happened.

2. Repeat (b) and (c) for different values of `a`, both more and less than `1`. By trial and error find a value of `a` that maximizes the amplitude of the solution. From the equation, what is its 'natural' or 'resonant' frequency? What should happen when `a` is set to this value? Test your hypothesis.

3. Prepare a brief (< 1 page) written report answering all the questions. Use complete sentences and standard mathematical notation. Do **not** get a printout.

The user examines what happens when a system is excited at different frequencies, the relationship between natural frequency and amplitude of the forced, damped ocsillator.