A Spring-Mass System

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 oscillator.

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