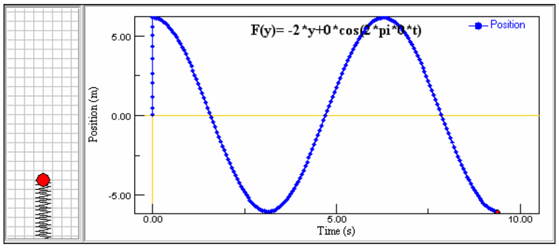
Worksheet for Exploration 16.5: Driven Motion and Resonance



Enter a value for the magnitude of the driving force and its frequency, the spring constant of the restoring force, or check the "show velocity" box, then press the "set parameters, then drag the ball" button. When you have done this, drag the ball into position and press "play" to run the animation (**position is given in meters and time is given in seconds**). Restart. *When you get a good-looking graph, right-click on it to clone the graph and resize it for a better view.*

a. Find the mass of the ball by using your knowledge of simple harmonic motion.
   i. Think about the simplest way to do this. What should you set the magnitude of the driving force to in order to determine the mass?

   m=________

b. Enable the velocity graph. Does the velocity lead or lag the position graph during simple harmonic motion?
   i. This is for those simple conditions you used in part a.

Set the restoring force to -2*y and the initial displacement from equilibrium to 0 m. Also set the magnitude of the driving force to -1 N. Vary the driving frequency between 0.10 Hz to 0.20 Hz in 0.01-Hz steps. You may want each animation to run a while before determining the maximum amplitude.

You may wish to examine the same conditions, but start with the initial amplitude at zero.

c. Draw a graph of the maximum amplitude of motion as a function of the frequency.
   i. First fill out the data table.

F_{drive} (Hz)	A_{max}
0.10	
0.11	
0.12	
0.13	
0.14	
0.15	
0.16	
0.17	
0.18	
0.19	
0.20	

ii. You may want to investigate further and see if you can predict the frequency that gives the largest amplitude, or measure with greater precision.

iii. You may use the graph template below, or paste your own graph over it.

d. What frequency gives the maximum amplitude? (measured)
   i. Does this agree with your prediction? Discuss why or why not.

Sketch: