

1 Mass/Spring PhET Exploration

Explore the mass/spring PhET at https://phet.colorado.edu/sims/html/masses-and-springs/latest/masses-and-springs_en.html and selecting “Lab”. You can either run it in your browser or download it. **Turn off gravity** (slider bar on right), and enable the vectors to see position, displacement, *etc* (see “vectors” icon at the bottom of the frame, between “intro” and “energy”).

First, set damping to zero (it should default to zero, but you can change it by going to the “energy” or “lab” icon at the bottom).

- (a) Explore the relative phases of position, velocity, and acceleration. Find a position/time where position and velocity are both positive, and a time when velocity is positive and position is negative.

What is the direction of acceleration in each case? Does this observation surprise you? Why or why not?

Are the relative phases of the position, velocity, and acceleration dependent on the amplitude of motion? Does this observation fit with your intuition?

- (b) Turn on damping. Do any of the observations in part (a) change? Does the damping time change if you change the mass or spring constant?
- (c) Use the PhET to help you better understand something about the mass/spring system. What did you understand better? What questions do you still have?