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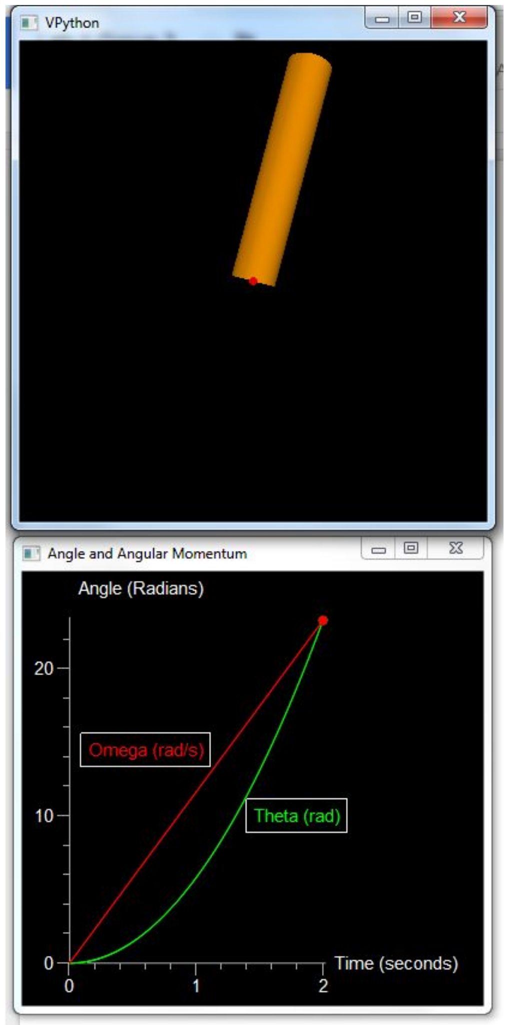
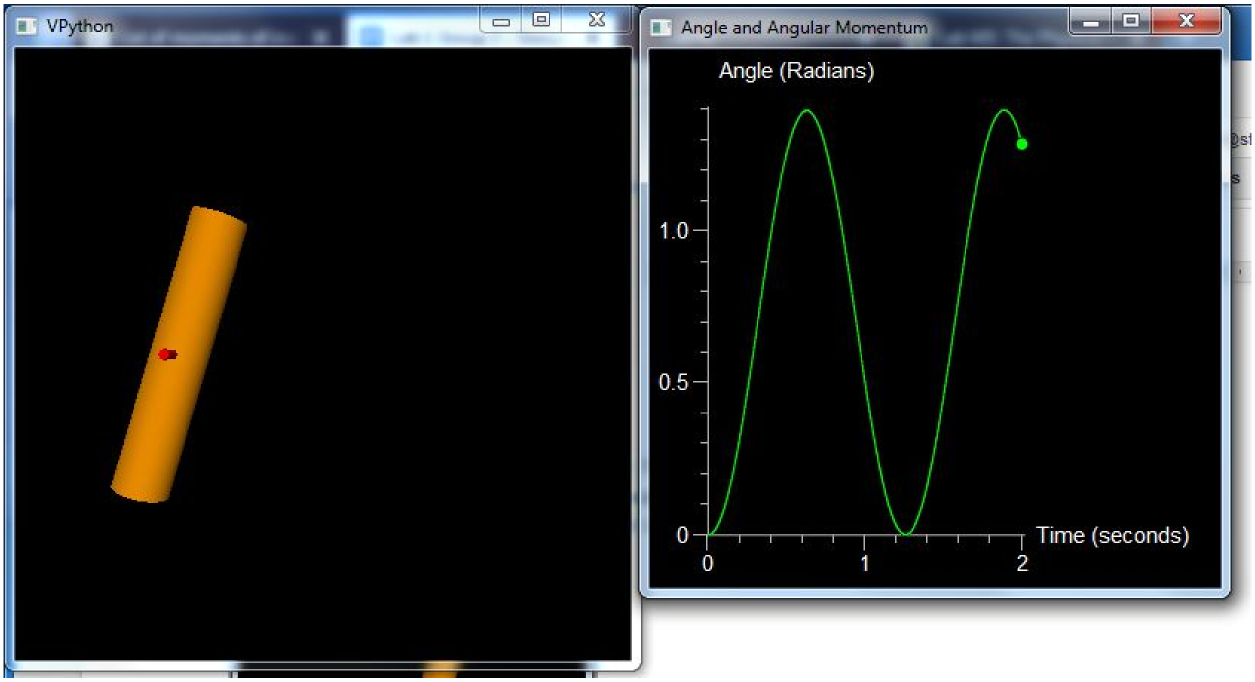
7 February 2018
Physics 242L

P86
For part a, we fixed the code using section 11.10. To find a theoretical value of torque and moment of inertia, we integrated $\int \tau \mathbf{I} dt$ between 0 and 2, and found our theoretical value for the ratio was in agreement with our graph ($\omega/\theta = 1$). The graph for b is shown here, and looks correct.

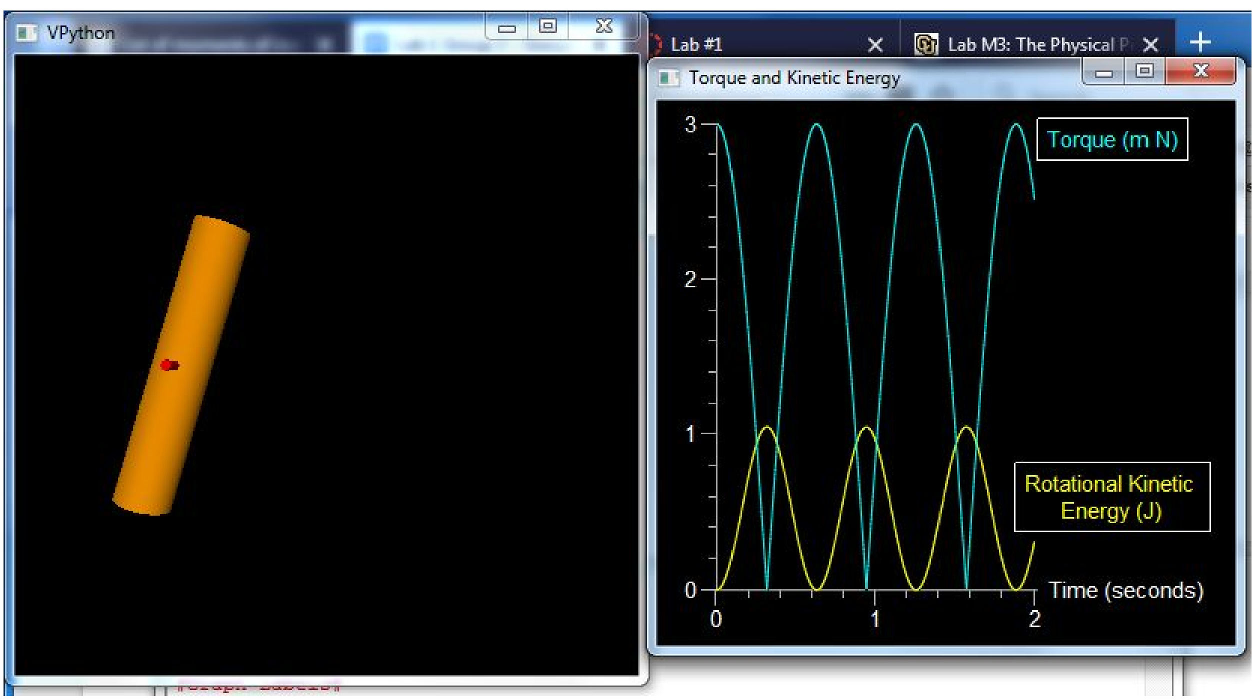


C.



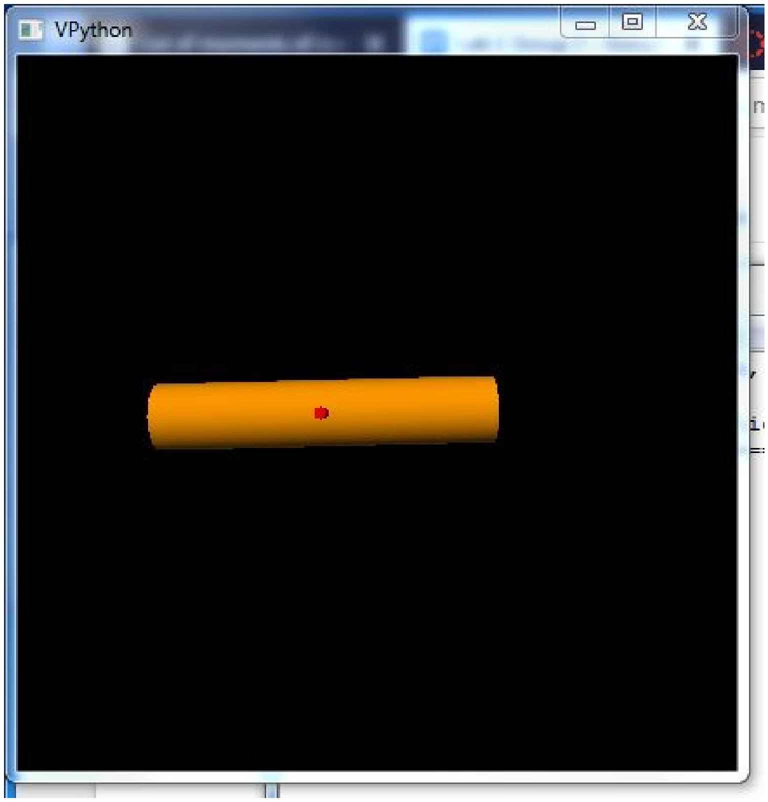
For c, we calculated θ = 0 at 1.26 sec. It should be zero at 2π/5, so this is approximately correct, ie. it is consistent.

D.

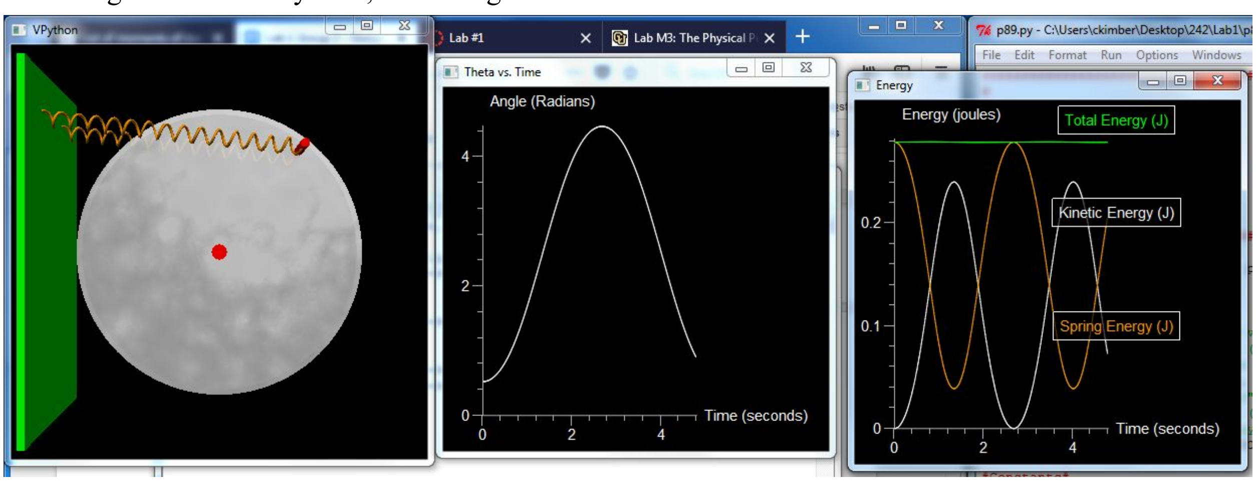


Part D. asks if the rotational kinetic energy is large when the torque is large, but actually they appear inversely related.

87.
This problem prompts us to update code from 86C, granting the axle and rod some initial linear momentum. This results simply in the rod/axle system slowly moving to the right while the oscillating torque spins the rod back and forth.



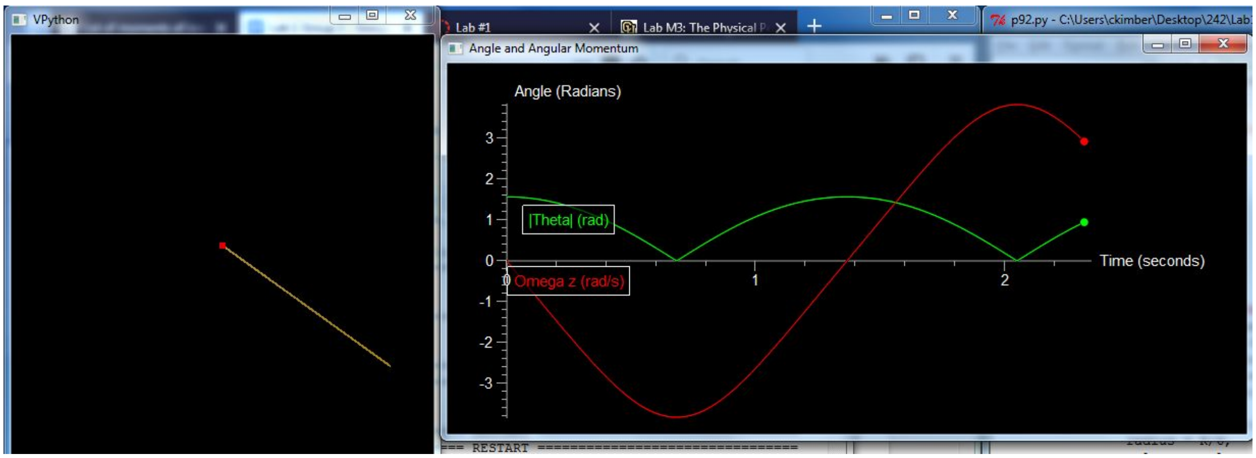
89.
We thought 89 was really cool, so that's good.



For part A, we got the proverbial ball rolling. Part B inquires if the system is a harmonic oscillator, and prompts us to make graphs. Pictured above are the graphs, and we found the period to be around 5.3s, and exchanging potential and kinetic energy with a defined periodicity does make the system a simple harmonic oscillator. Part C has us graphing total, kinetic, and spring potential energy. The total energy is constant, given that we make delta t small enough.

92.

This problem vaguely gives instructions to simulate a meter stick hanging by one end, subject only to the oppressive regime of gravity and the small glint of life with which it hangs onto the axle. This is a harmonic oscillator at any angle, it does not exhibit chaos due to its simplicity. However, around an angle of 1 radian, the small angle approximation for the period of a physical pendulum starts to differ from the observed period by a significant margin. We found the period in the small angle domain to be 2.318s.



Additional lab notes: The work split was fairly even on both the physics and programming side of things. A good 50/50 split.