Lab One (Python 2)

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1 Problem 86

With a constant torque of magnitude 2 Nm, the final angle is 23.30 radians, the final magnitude of the angular velocity is 23.30 rads/s. The ratio of the angular speed to the angle is approximately 1. Based on the previously mentioned relationship, the plots of ω vs t and θ vs t are appropriate.

The period of the system with a magnitude of torque of $3\cos 5t$ is approximately 1.3 seconds. The rotational energy is not large when the torque is large.

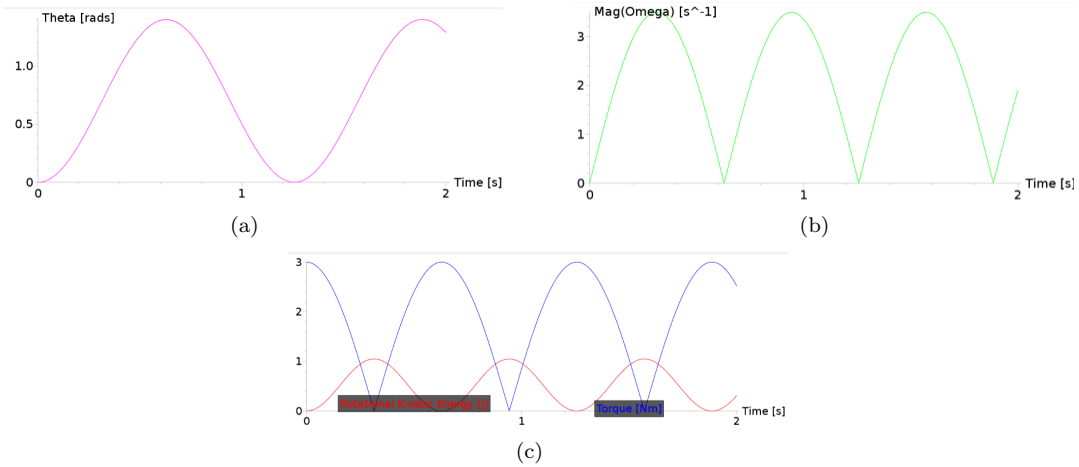


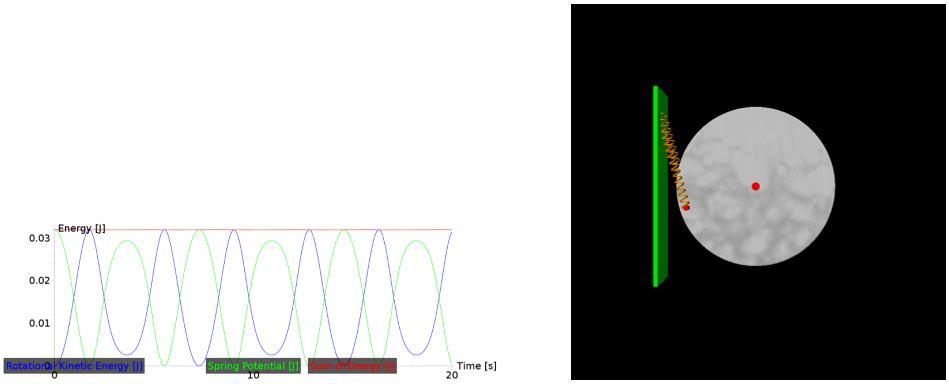
Figure 1: Outputs for Question 86

2 Problem 87

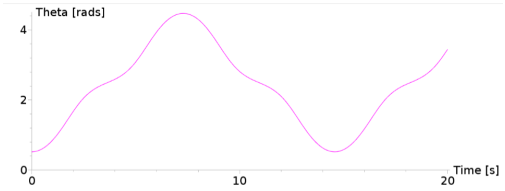
While there is a torque applied to the axle with a magnitude of 0.04 Nm, there doesn't seem to be any physical change to the system. The reason for this is a result of the direction that the force is applied, this change propagates down to the calculation of the omega_scalar variable. Since the angular momentum is in the $\hat{y}$ direction and the axis of rotation is in the $\hat{z}$ direction the resulting dot product is zero.

3 Problem 89

The period of rotation for this system is approximately 15 seconds. The system is a harmonic oscillator. The sum of the energies should have little perturbation.



(a) (b)

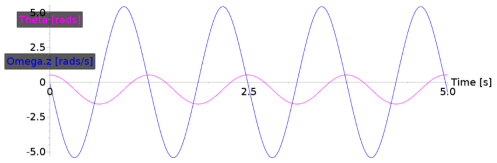


(c)

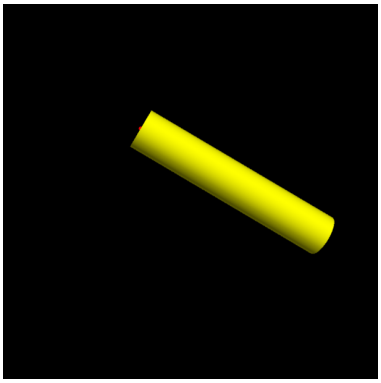
Figure 2: Outputs for Question 89

4 Problem 92

This system is a harmonic oscillator for large and small angles.



(a)



(b)

Figure 3: Outputs for Question 92