1. Determine the equations of motion for the following mechanical system.

2. Determine the equations of motion for the following electrical circuit. How are these compared with the equations you found in the previous problem. Show the analogies if any.

3. Do problem 2.1 in text, part (a.)

4. Consider the inverted pendulum below which is mounted on a motor driven cart.

This may be an acceptable model for the attitude control of a space booster on take off. The objective is to keep the space booster in a vertical position. Derive the equations of motion.

Argue why this is not a linear system.

Assuming small perturbations around its (unstable) equilibrium derive a linear model.