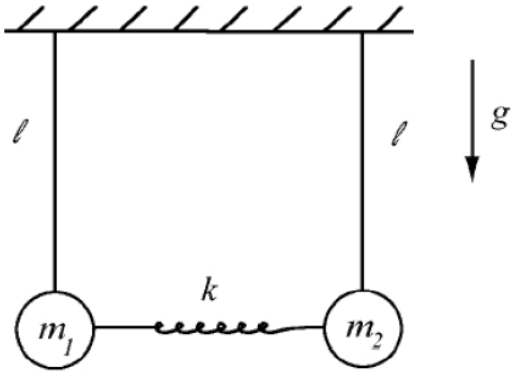
2.003/1.053 Dynamics and Controls I
Spring 2007
Problem Set 8

Issued on Wednesday, April 18^{th}
Due in lecture on Wednesday, April 25^{th}

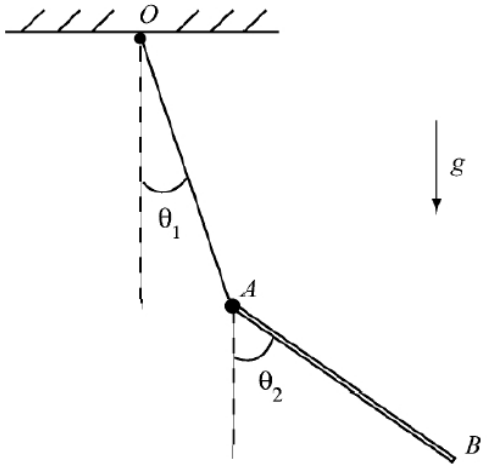
1 Double mass and spring pendulum

Derive equations describing small motions of the system about the configuration shown below. The links are rigid and massless.



2 String and rod pendulum

Derive the equations of motion for the system shown below. The link AB is rigid and uniform and has mass M and length L_2. The rope OA, which remains taut, is massless and has length L_1.



3 Cart and pendulum system

For the system below, indicate the equilibrium points and find the linearized equations of motion using Lagranges'equations. Assume that the spring and dashpot deflect only horizontally and that the force F is always applied horizontally. Consider damping due to the dashpot as an external, non-conservative force.