EE106A Discussion 11: Midterm Preparation

Problem 1: Using knowledge of adjoints, prove that the forward kinematics map is the same as composing subsequent rigid body transformations.

Problem 2: Prove that the spatial velocity of a manipulator does not depend on the location of the tool frame (as long as it moves with the end-effector).

Problem 3: Show that a manipulator with 4 revolute joints at the origin will necessarily have a singularity.

Problem 4: Calculate the dynamics of the a box with mass m sliding down a ramp of mass M. Assume there is no friction in the system. Then, develop a control law for this motion.
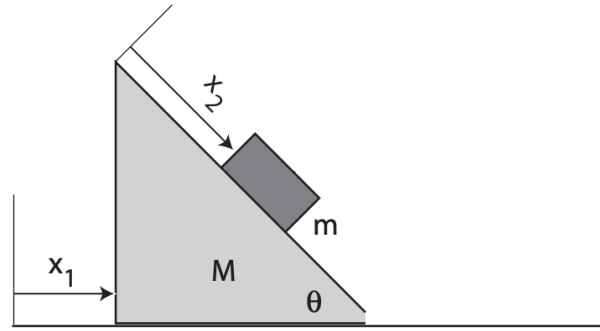

Figure 1: Image sourced from http://www.dzre.com/alex/P441/lectures/lec_18.pdf