Discussion Questions

Topology

1. How is the topology of a configuration space relevant to motion planning?
2. Define homeomorphism, diffeomorphism, manifold, differentiable manifold, and homotopy class.
3. Considering homeomorphism, how many holes does a shirt have? What about pants? Socks?
4. Use this information to answer questions 4 a-c:

   Imagine you have a robot with a mobile base and a jointed manipulator attached at the top, as in the following figure. Assume the base can only move in one dimension (along a straight line) and the manipulator only has one revolute joint (which can freely move in a circle).

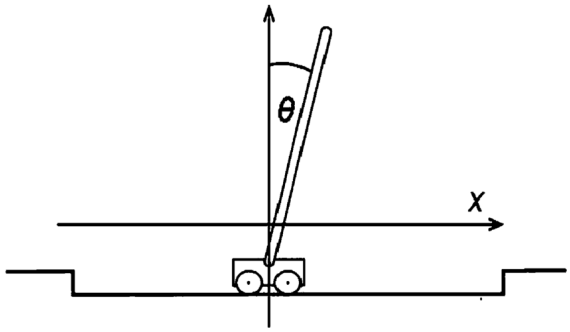

Figure 1: A robot with a mobile base and a single revolute joint

   a. What is the shape of the cspace for this robot?
   b. How would you specify the coordinates of a configuration in this cspace?
   c. How could you compute the distance between two configurations in this space? Is there more than one way?