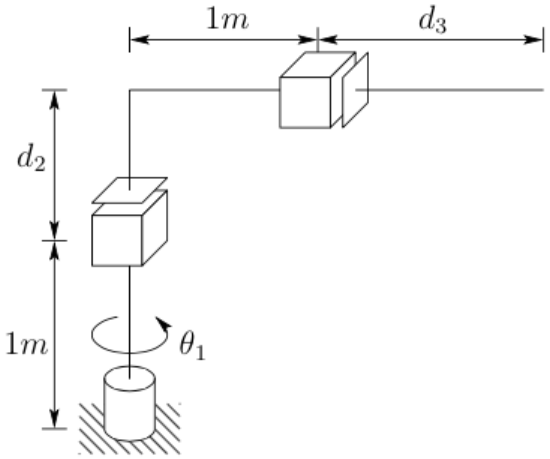
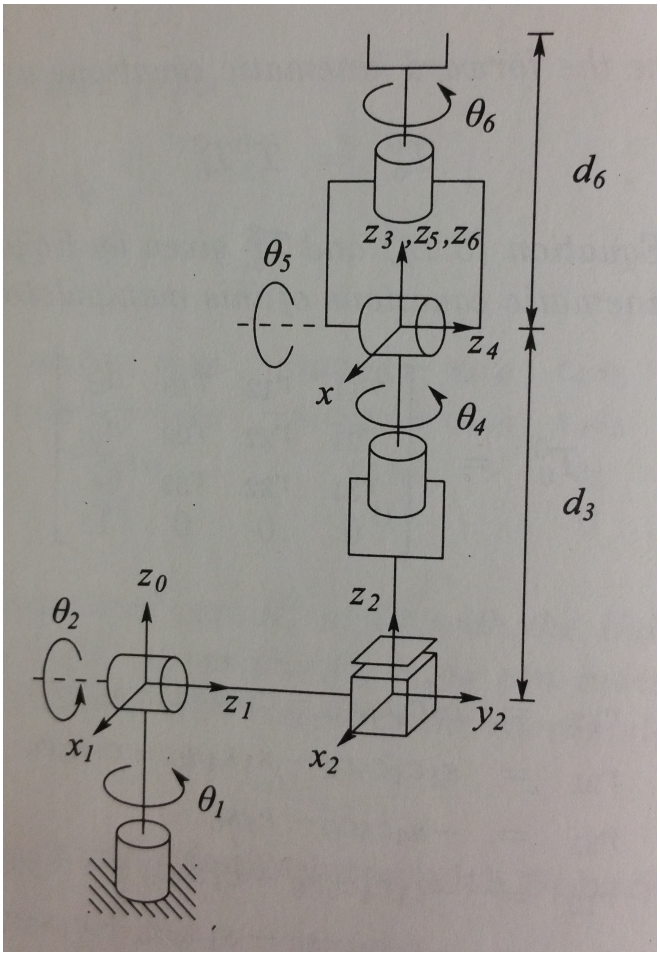
Homework 6a (Problem numbers from textbook)

3.13 Solve the inverse position kinematics for the cylindrical manipulator shown below (i.e., given the desired position of the end effector, find the corresponding variables for the robot joints).



3.18 The Stanford manipulator shown below has a spherical wrist.



Given a desired position o and orientation R of the end effector,

1. Compute the desired coordinates of the wrist center o_c^0.
2. Solve the inverse position kinematics, that is, find values of the first three joint variables that will place the wrist center at o_c^0. Is the solution unique? How many solutions did you find?
3. Compute the rotation matrix R_3^0. Using R_3^0 and the given desired orientation R, find the matrix R_6^3. Solve the inverse orientation problem for this manipulator by finding a set of Euler angles corresponding to the matrix R_6^3.

3.19 Repeat Problem 3.18 for the PUMA 260 manipulator shown below, which also has a spherical wrist. How many total solutions did you find?