ME 115(1): Homework #1

(Due Friday, April 7, 2006)

Problem #1:

Part (a): For Manipulator (iv) in Figure 3.23 of MLS, solve the inverse kinematic problem, where the goal is to place the origin of the tool frame at a desired position.

Part (b): For Manipulator (iii) in Figure 3.24 of MLS (i.e., the "Stanford manipulator"), solve the inverse kinematics problem. That is, given a desired position and orientation of the tool frame, find the joint variables that place that manipulator tool frame at that location. Note that the "regional" part of this manipulator (the part of the linkage preceding the wrist) is exactly the same as part (a).

Problem #2: (elbow manipulator)

- Compute the hybrid Jacobian for the 3-degree-of-freedom Elbow manipulator. Specifically, compute the relationship between the joint angle velocities and the translational velocity of the tool frame origin.
- Find the singularities of this manipulator.
- Sketch the geometry of these singularities.