Problem 1: Inverse Kinematics for 3DOF Manipulators

(a) Describe the reachable workspace of the robot.

(b) Use Paden-Kahan subproblems to solve the inverse kinematics problem for this manipulator. You do not need to write out the details of how you would find the exact solution for each subproblem. It suffices to indicate how you would break up the inverse kinematics problem into PK subproblems. Remember to clearly indicate which subproblem you are using in each step, and what conveniently chosen points you are using to make your reductions.

(c) Indicate the maximum number of possible inverse kinematics solutions.
Problem 2: Inverse Kinematics for 6DOF Manipulators

The above figure shows the 6DOF Stanford arm in its initial configuration, with 5 revolute joints
and one prismatic joint (joint 3). You may assume that in the initial configuration, $q_w$ is a distance
$l_1$ away from $q_1$. Further assume that $0 \leq \theta_3 \leq d_{max}$.

(a) Describe the reachable workspace and the dexterous workspace of the robot.

(b) Use Paden-Kahan subproblems to solve the inverse kinematics problem for this manipulator.
You do not need to write out the details of how you would find the exact solution for each
subproblem. It suffices to indicate how you would break up the inverse kinematics problem
into PK subproblems. Remember to clearly indicate which subproblem you are using in each
step, and what conveniently chosen points you are using to make your reductions.

(c) Indicate the maximum number of possible inverse kinematics solutions.