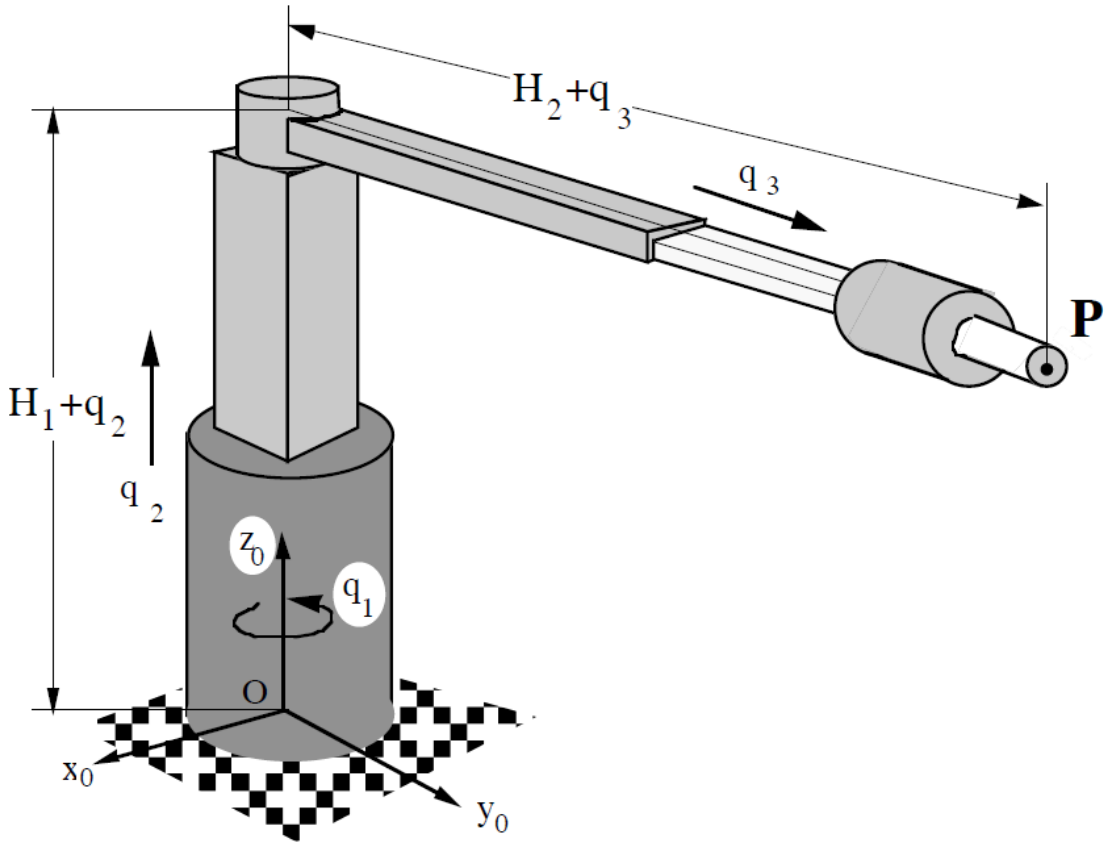
Inverse Kinematics – exercise:

The manipulator shown in the figure has one revolute and two prismatic joints, with variables q_1, q_2 and q_3 correspondingly, which are also shown in the figure.



a. Find the solution of the inverse kinematics. i.e. given the orientation and position of the tip of the robot,

$$T_{03} = [n \quad o \quad a \quad p] = \begin{bmatrix} n_x & o_x & a_x & p_x \\ n_y & o_y & a_y & p_y \\ n_z & o_z & a_z & p_z \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

find the expression of the joint variables in relation to the elements of matrix T_{03} as well as the parameters of the robot.

b. Find the joint values of the robot, when $H_1 = 3\,m$, $H_2 = 1\,m$ and its end effector position is $[1.4 \quad 0.8 \quad 3.9]^T$.