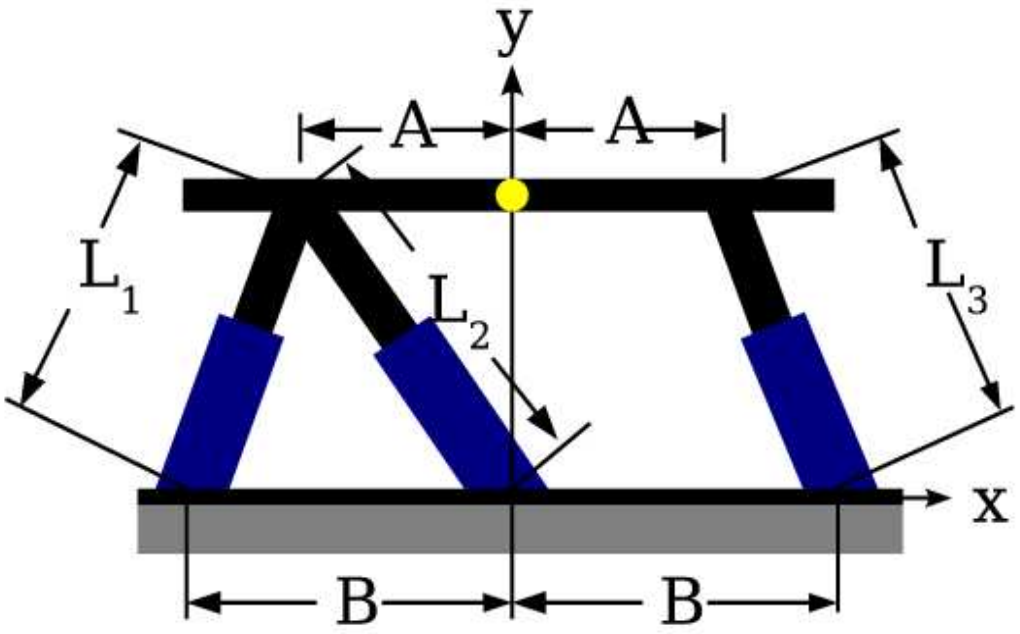

A 3-D motion platform is built with three linear actuators which are mounted by their two ends on pivots. The lengths of the actuators L_1, L_2, and L_3, can be controlled. The lower horizontal (plate) line is fixed to the floor. The upper plate (flying top plate) moves when the actuators change length. All the motion is in the x-y plane. The yellow circle is the center of the flying top plate. The x and y position of the center of the flying top plate and angle, θ, from the horizontal (ccw = +) of the flying top plate change as the actuator lengths L_1, L_2, and L_3 change.

1

Write an expression for the L_1, L_2, and L_3 as functions of x, y, and θ the angle from the horizontal (ccw = +), and constants A and B.

2

If the three actuators have a maximum length of L_{max}, what is the maximum height y_{max} that the flying top plate can move while keeping $x = 0$ and $\theta = 0$? Note: there are two cases to consider.