A rigid rod of length L rests upon a horizontal frictionless floor and leans against a frictionless wall. The rod is weightless except for a mass M located at its center. The rod moves only in a vertical plane.

1. Write the Lagrangian for this system using x, the distance from the lower end of the rod to the wall, as the coordinate.

2. If the rod is initially at rest and the initial value of y, the distance from the upper end of the rod to the floor, is y_0, find the value of y at the instant the upper end of the rod ceases to touch the wall.