

## Classical Mechanics – Idzerda

Two uniform bars are hinged together at one end with a massless hinge and are free to slide in contact with a smooth, semicircular bowl of radius  $R$  (as shown below). One rod has mass  $M_1$  and length  $2l_1$  and the second rod has mass  $M_2$  and length  $2l_2$ . The bowl is attached to a table and does not move. The system is acted on by gravity.

- How many independent degrees of freedom are there in this system?
- Determine the potential energy of the two bar system.
- Determine the Lagrangian for the two bar system.
- Determine the angle  $\theta$  made by the first bar with respect to the horizontal after the two bar system reaches equilibrium (motion is damped out or at steady state).

