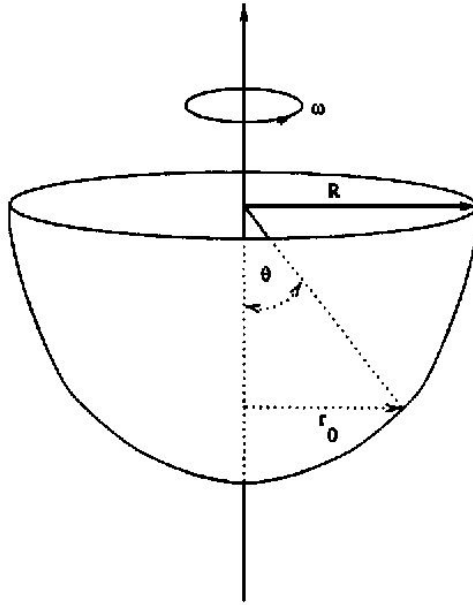


QP12



A small marble of mass M is placed on a hemispherical bowl of radius R as shown in the figure. If the bowl is spun (around its vertical axis) with the constant speed ω , the marble eventually settles at a distance r_0 from the axis.

- (3 points) Find the magnitude and the angle with respect to the vertical axis of the force exerted by the bowl on the marble.
- (2 points) Find r_0 as a function of ω .
- (2 points) Note that if ω is too small, the answer to part (b) does not make sense. What happens of the angular velocity ω is too small?