

## Problem 31

A third derivation of the pendulum equation depends on the principle of angular momentum: The rate of change of angular momentum about any point is equal to the net external moment about the same point.

- (a) Show that the angular momentum  $M$ , or moment of momentum, about the point of support is given by  $M = mL^2 d\theta/dt$ .
- (b) Set  $dM/dt$  equal to the moment of the gravitational force, and show that the resulting equation reduces to Eq. (12). Note that positive moments are counterclockwise.