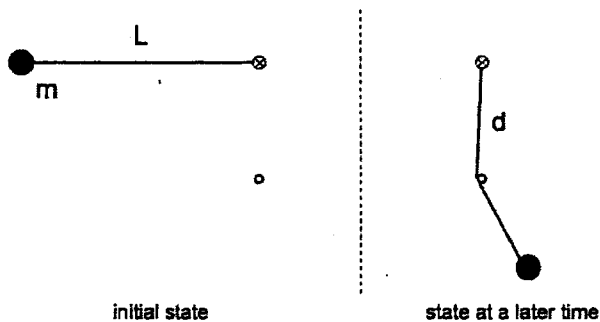


Ball on a String Wrapping Around a Nail



A ball of mass m is attached to a massless string of length L . The ball is released from rest as shown at left, with the acceleration of gravity g pointing down, and travels along a circular arc. As the ball reaches the bottom of the arc, the string starts wrapping around a nail (having a negligible diameter) located a distance d below the center of the arc. (See diagram above.)

- (3 points) What is the tension in the string just before it makes contact with the nail?
- (3 points) What is the tension in the string just after it makes contact with the nail?
- (4 points) What is the minimum value of d (expressed as a function of L , g , and m) for which the ball executes a complete circle around the nail, with the string remaining taut?