Questions:

1. The right-circular conical tank shown in Figure 1.31 loses water out of a circular hole at it's bottom. Determine a differential equation for the height of the water h at a time t. The radius of the hole is 2 inches $g = 32\frac{ft}{s^2}$,and the friction/contraction factor is c= 0.6

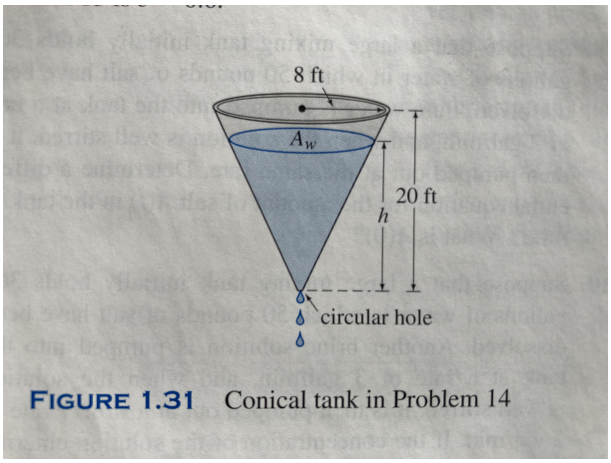
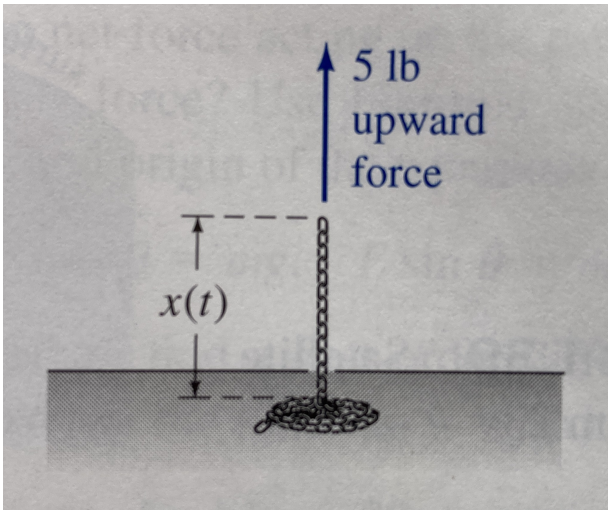
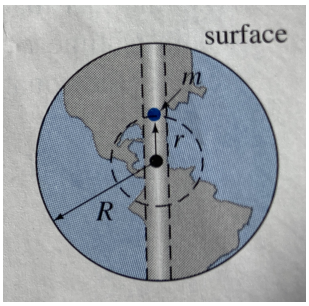


FIGURE 1.31 Conical tank in Problem 14

2. A uniform 10-foot-long chain is coiled loosely on the ground. As shown below, one end of the chain is pulled vertically upward by means of a constant force of 5lbs. The chain weighs 1lb/ft. Determine a differential equation for the height h(x) of the end above ground level at a time t.



3. Suppose a hole is drilled through the center of the earth and a bowling ball of mass m is dropped into the hole, as shown below. Construct a mathematical model that describes the motion og the ball. At time t, let r denote the distance from the center of the earth to the mass m, M denote the mass of the earth, M_r denote the mass of that portion of the earth within a sphere of radius r, and δ denote the constant density of the earth.



4. Suppose a uniform chain of length L with weight density ρ is draped over a friction-less peg as shown in the diagram, and is displaced by a length of x_0. Create a differential equation that models the displacement of the chain at a time t.