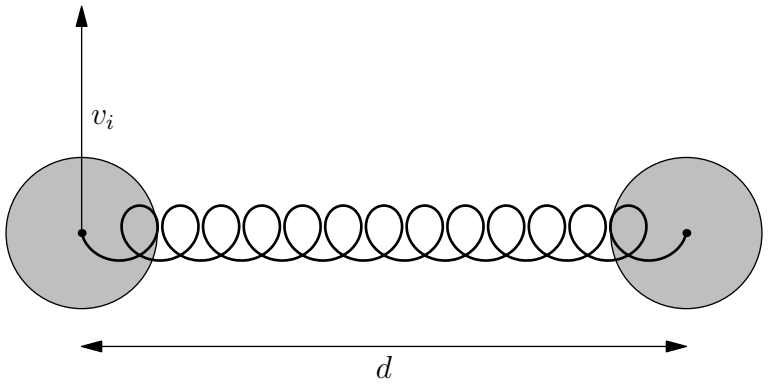
J98M.2—Pucks on a Spring

Problem

Two identical pucks of mass m can slide without friction on a horizontal table. Their centers are connected by an ideal massless spring of equilibrium length d and spring constant k. Initially the system is at rest. At $t = 0$ one of the pucks is hit sharply, which gives it velocity v_i normal to the spring.



a) Derive a differential equation for the length of the spring as a function of time, $l(t)$, for $t > 0$.

b) What is the minimum length of the spring during the motion?

c) Derive an algebraic equation for the maximum length. Find its approximate solution for small v_i.