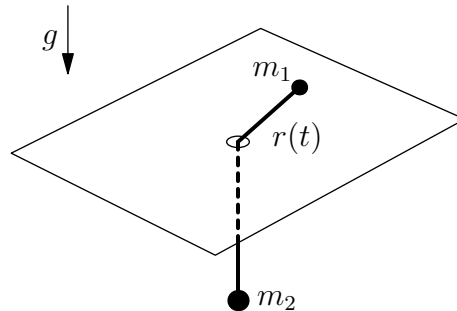# J00M.3—Orbiting Mass on a String

## Problem

A mass $m_1$ slides without friction on a horizontal table. The mass is tied to a string with negligible mass that passes without friction through a small hole. A mass $m_2$ is tied to the other end of the string. The uniform gravitational acceleration $g$ is normal to the table.



The orbit of $m_1$ is only slightly perturbed from circular. The masses $m_1$ and $m_2$ are chosen so the orbit is closed, with one maximum and one minimum of the distance $r(t)$ of $m_1$ from the hole, when computed to first order in the departure from a circular orbit. Find $m_2$ in terms of the other parameters.