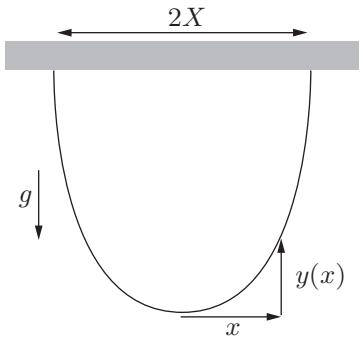
M09M.2 - Shape of a Suspended Rope (M93M.3)

Problem

An ideal perfectly flexible rope of length $2L$ and fixed mass per unit length μ is hanging at rest in a uniform gravitational field, g. The rope is held at its ends by supports at the same level and separated by distance $2X$.



a) Find the shape, $y(x)$, assumed by the rope.

b) Find the tension, T_0, of the rope at its midpoint in the limit where $X \ll L$.