M06M.3 - Hanging Spring

Problem

A spring has spring constant K, unstretched length L, and mass per unit length ρ (when unstretched). The spring is suspended from one end in a constant gravitational field, g, and stretches under its own weight. For a point whose distance from the upper end of the spring is x when unstretched, find its distance $y(x)$ from the upper end when the spring is stretched.