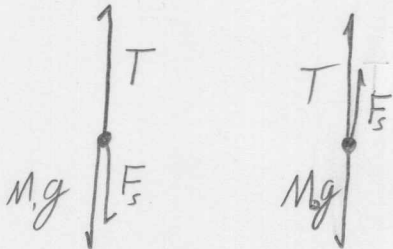
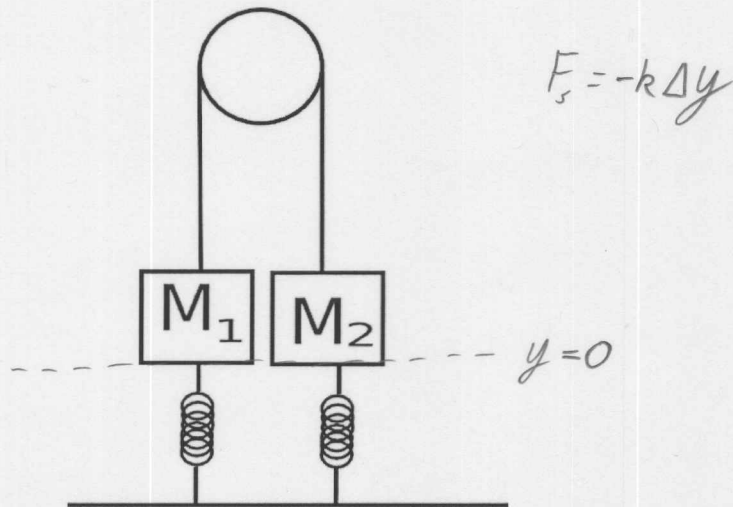


Force Problems

The contraption below is an atwood machine with springs attached between the ground and each of the weights. The spring on M_1 has a spring constant k_1 . The spring on M_2 has a spring constant k_2 . When the weights are at the same level, as in the picture, the springs are in equilibrium.

Find an expression for the displacement from equilibrium of M_1 in terms of M_2 , k_1 , and k_2 .



$$T - M_1g + F_s = 0$$

$$T - M_2g + F_s = 0$$

Leave these signs as plus
Let the displacement take care
of the sign

$$\text{So: } T - M_1g - k_1y_1 = 0$$

$$T - M_2g - k_2y_2 = 0$$

Continued ↓

$$T - M_1 g - k_1 y_1 = T - M_2 g + k_2 y_1$$

and solve for y_1 ,

$$g(M_2 - M_1) = y_1(k_1 + k_2)$$

$$\boxed{y_1 = \frac{M_2 - M_1}{k_1 + k_2} g}$$