A stretched string of mass 20 g vibrates with a frequency of 30 Hz in its fundamental mode and the supports are 40 cm apart. The amplitude of vibrations at the antinode is 4 cm. Calculate the velocity of propagation of the wave in the string as well as the tension in it.

Solution

$$v = f\lambda = f2l = 30 * 2 * 40 * 0.01 = 24\frac{\text{m}}{\text{s}}$$

To obtain the tension is a bit more complicated because it appears

within a square root:

$$v = \sqrt{\frac{T}{\mu}} \gg T = \mu v^2 = \frac{m}{l}v^2 = \frac{20 * 0.001}{40 * 0.01}24^2 = 28{,}8\ \text{N}$$