46. Since the rope is fixed at both ends, then the phrase "second-harmonic standing wave pattern" describes the oscillation shown in Figure 17-21(b), where

$$\lambda = L \qquad \text{and} \qquad f = \frac{v}{L}$$

(see Eq. 17-52 and Eq. 17-53).

(a) Comparing the given function with Eq. 17-47, we obtain $k = \pi/2$ and $\omega = 12\pi$ (SI units understood). Since $k = 2\pi/\lambda$ then

$$\frac{2\pi}{\lambda} = \frac{\pi}{2} \implies \lambda = 4 \text{ m} \implies L = 4 \text{ m} .$$

(b) Since $\omega = 2\pi f$ then

$$2\pi f = 12\pi \implies f = 6 \text{ Hz} \implies v = f\lambda = 24 \text{ m/s} .$$

(c) Using Eq. 17-25, we have

$$\begin{aligned} v &= \sqrt{\frac{\tau}{\mu}} \\ 24 &= \sqrt{\frac{200}{m/L}} \end{aligned}$$

with leads to $m = 1.4$ kg.

(d) Now, "third-harmonic ... pattern" draws our attention to Figure 17-22(c), where

$$f = \frac{3v}{2L} = \frac{3(24)}{2(4)} = 9 \text{ Hz}$$

so that $T = 1/f = 0.11$ s.