1. **Units.** What are the units of parameter $\kappa$ in the following modified wave equation for the transverse fluctuations on a string?

\[
\frac{\partial^2 y}{\partial t^2} = \tau \frac{\partial^2 y}{\partial x^2} + \kappa \frac{\partial^4 y}{\partial x^4}
\]

\[
\frac{kq}{m} \frac{m^4}{s^2} = \left[ \frac{k^2 m}{m^4} \right]
\]

2. **Energy Transfer on a String.** You are given a sinusoidal traveling wave on a string. Which of the following is true?

- X The rate of energy transfer past a given point is greatest when the point has maximum displacement.
- X The rate of energy transfer past a given point is constant.
- C The rate of energy transfer past a given point is greatest when the point has zero displacement.
- X Traveling waves don’t transfer energy.
- X You can’t tell which is true from the given information.
3. **Energy on a String.** Consider two strings with equal tension $\tau$ and mass per unit length $\mu$. Each has a traveling wave pulse on them, as illustrated below.

Which of the following is true?

A. The energy in string (a) is 9 times the energy in string (b).
B. The energy density in the region of the pulse for string (b) is 9 times the energy density in the region of the pulse for string (a).
C. The energy in string (b) is one third the energy in string (a).
D. The energy density in the region of the pulse for string (b) is three times the energy density of the region of the pulse for string (a).
E. More than one of the above is true.
F. None of the above is true.