Chapter 14:

A very long string has 10^{-4} kg/m, and transports a wave with $\omega = 10$/sec, A = 0.01 m, at $v_p = 1$ m/s. What power is being transported by the wave?

Answer: 5 $\times 10^{-7}$ Watts.

A standing wave on a string 1 m long travels at 100 m/s. It is fixed at both ends, and the standing wave has 10 half-wavelengths from end to end. What is the frequency of this standing wave?

Answer: 500 Hz.

A sound source has level β_1 of 20 dB at a certain distance. If it is moved closer, to 1/4 the original distance, what is its new sound level β_2?

Answer: 32 dB.

A standing wave on a string 1 m long has frequency 1000 Hz, and displays 3 half-wavelengths. What is the tension in the string if it has a mass of 10^{-5} kg/m?

Answer: 4.5 N.

An ambulance is travelling at 100 m/s down a long

straight street, with a siren that has a rest frequency of 1000 Hz. The speed of sound is 340 m/s. A pickup truck at the other end of the street is travelling directly toward the ambulance, also at 100 m/s. What siren frequency does the loser in the pickup truck hear?

Answer: 1833 Hz.

In a dispersive medium, the phase speed of waves is 1000 m/s. A wave pulse is created (it can be viewed as a superposition of waves of many different wavelengths). The dispersion relation for the medium is $\omega(k) = bk^3$, where b is a positive constant. What is the group velocity of the pulse? This is the actual speed with which it propagates in the medium.

Answer: 3000 m/s.