8th Assignment, due Wednesday **December 02nd** (class, no later than NOON) - distributed November 20th

Please note your name clearly on your solutions, number the pages and write notes along the way, so that it is easy to follow your thought process.
No pencil!

1.) Explain in your own words: (6 points)
a) What is the difference between longitudinal and transverse waves?
b) Which conditions have to apply for a motion to be called simple harmonic?
c) Why it is important to know the natural frequency of an object. Give an example of where resonance is a positive effect.
d) What we understand under the term interference. What are the characteristics of a standing wave?

2.) The hot and cold reservoirs of a Carnot engine have temperatures of 845 and 395 K, respectively. The engine does the work of lifting a 15.0-kg block straight up from rest, so that at a height of 5.00 m the block has a speed of 8.50 m/s. How much heat must be put into the engine?   (4 points)

3.) A spring is hung from the ceiling. A 0.450-kg block is then attached to the free end of the spring. When released from rest, the block drops 0.150 m before momentarily coming to rest.
(a) What is the spring constant of the spring?
(b) Find the angular frequency of the block's vibrations.   (3 points)

4.) A pendulum clock can be approximated as a simple pendulum of length 1.00 m and keeps accurate time at a location where $g = 9.83$ m/s^2. In a location where $g = 9.78$ m/s^2, what must be the new length of the pendulum, such that the clock continues to keep accurate time?   (3 points)

5.) Light is an electromagnetic wave and travels at a speed of 3.00×10^8 m/s. The human eye is most sensitive to yellow-green light, which has a wavelength of 5.45×10^{-7} m. What is the frequency of this light?   (2 points)

6.) A wave causes a displacement y that is given in meters according to
$y = (0.45) \sin (8.0\pi t + \pi x)$, where t and x are expressed in seconds and meters, respectively.
(a) Find the amplitude, the frequency, the wavelength, and the speed of the wave.
(b) Is this wave traveling in the +x or -x direction, explain?
                                                                (4 points)

7.) A sound wave travels twice as far in neon (Ne) as it does in krypton (Kr) in the same time interval. Both neon and krypton can be treated as monatomic ideal gases. The atomic mass of neon is 20.2 u, and that of krypton is 83.8 u. The temperature of the krypton is 293 K. What is the temperature of the neon?   (3 points)

8.) A recording engineer works in a soundproofed room that is 44.0 dB quieter than the outside. If the sound intensity in the room is 1.20×10^{-10} W/m^2, what is the intensity outside?   (2 points)

9.) A bungee jumper jumps from rest and screams with a frequency of 589 Hz. The air temperature is 20 °C. what is the frequency heard by the people on the ground below when she has fallen a distance of 11.0 m? Assume that the bungee cord has not yet taken effect, so she is in free-fall.   (3 points)