Assignment II, PHYS 150 (Physics of Sound and Music)
Wave Speed, Period, and Frequency
Due 1/17/14 at start of class

Recall that, for any non-dispersive wave, we know that $c_{\text{wave}} = \lambda f$.

Please answer these questions on a separate sheet.

1. What is your name?
2. The speed of sound in (dry) air can be approximated with the equation:

$$c_{\text{air}} \approx (331.3 \text{ m/s}) \cdot \sqrt{\left(1 + \frac{\theta}{273.15°\text{C}}\right)}$$

   with θ the temperature of the air in degrees Celcius. What would the speed of dry air be if the air temperature is:

   a) 0°C?
   b) 21°C?
   c) -10°C?

3. What is the wavelength for your favorite FM radio station on a normal day (assume 20°C for the temperature)? (Recall that the station number on the dial is the frequency in MHz and 1 MHz = 1000000 Hz).
4. The highest temperature ever recorded in the US was 56.7°C. The lowest ever recorded in the US was -62.0°C. If you use the equation given above for the speed of sound in air, this gives you speeds of about 364 m/s and 291 m/s, respectively. (The equation given in question two actually becomes a little inaccurate at these temperatures, but as a first approximation it isn't too horrible). Here's the question.....why don't you have to change your tuning for your favorite radio station – even a little bit – on particularly hot or cold days?
5. In a 20 degree Celcius room, what is the wavelength of A-440?
6. What would the wavelength of A-440 be underwater? ($c_{\text{water}} \sim 1500$ m/s)
7. What would the frequency in air be for a wave with the same wavelength as your answer to number 6? (Assume air at 20°C).
8. Would the pitch be higher or lower than A-440 for a sound-wave with the frequency found in question 7?
9. Would the pitch generated in question 7 be audible to a human?