Physics 221 – Spring 2012
Quiz #2

This is a group quiz

Names: _____

1. Compare and Contrast the Doppler Effect and a Sonic Boom.
    a. Do the actual sounds heard have something in common?

    b. How about the underlying physics, how closely related are they (use diagrams to support your answer)?

2. A particular speaker at a concert puts out 110 Watts of power.
    a. Calculate both the intensity and the intensity level at 1 meter.

    b. Determine how far you must stand from the speaker to receive an intensity level equal to the threshold of pain (120 dB)?

    c. How far must you be for the sound level to be 80dB?

3. On a very cold day, -10°C, you are driving down the road at 15 m/s and you see a car that is honking its horn. You have perfect pitch so know you hear exactly 457 Hz. It's a blizzard so you are having a hard time telling if the car is moving, much less if it's moving towards or away from you. Since you also happen to know that this particular make of car puts out a frequency of 425 hz from its horn, you are able to quickly determine if the car is heading towards or away from you and you are great with numbers and in your head determine the car's exact speed.
    a. Is the car moving towards or away from you?

    b. What is its speed?

$f' = f\frac{v \pm v_o}{v \pm v_s}$, + observer moving towards, - observer moving away, - source moving towards, + source moving away.

$v = 331 \text{ m/s} \sqrt{1 + \frac{T}{273}}$ $\qquad I = \frac{P}{4\pi r^2}$ $\qquad \beta = 10 \log\left(\frac{I}{I_o}\right)$ $\qquad I_o = 1 \times 10^{-12} \text{ W/m}^2$