TEST # 1. PHYS 204. SPRING 2003. 03/04/03

NAME:

1. A train on one track moves in the same direction as a second train on the adjacent track. The first train, which is ahead of the second train and moves with a speed of 32 m/s, blows a horn whose frequency is 125 Hz. If the frequency heard on the second train is 131 Hz, what is its speed?

2. A string, fixed at both ends, has a length of 4 m and a mass per unit length of 0.01 kg/m. The tension in the string is 0.25 N.

(a) Obtain the speed of a transverse wave traveling along the string.

(b) The frequency, period and wavelength of the 3rd harmonic emitted by the string.

(c) Obtain the wave's intensity level if the wave's intensity is 10^{-11} W/m^2.

(d) The tension on the string is kept the same as before, but the length of the string is increased by a factor of 2:

(d1) Does the speed of the transverse wave change?

(d2) Calculate the new fundamental frequency of the string.

3. Two point charges of equal magnitude are 8.0 cm apart. At the midpoint of the line connecting them, their combined electric field has a magnitude of 25 N/C. Find the magnitude and sign of the charges.

4. (a) A given system has the equipotential lines shown in the figure. What are the magnitude and direction of the electric field?

(b) Two point charges, each equal to $+q$, are placed on the x axis at $x = -1$ m and $x = +1$ m. As one moves along the $x-$axis, does the potential look like a peak or a valley near the origin? (i.e., does the potential has a maximum or a minimum— bottom of a valley— at the origin?) Explain.

(c) Make a qualitative sketch of the equipotential lines produced by a point positive charge, for a dipole and for a parallel plate capacitor.

5. Find the equivalent resistance between points a and B shown in the figure.