Homework #1 – due week of Sept. 8
Physics 375 Sections 0201 (Wed.), 0401 (Thurs.)
Fall 2008

Show your work!

1) Suppose 10 students make the following measurements of the length of the classroom in meters:
5.056; 5.012; 5.084; 5.011; 5.113; 5.062; 5.099; 5.044; 5.055
Calculate the mean, standard deviation, and standard deviation of the mean for this sample distribution. Please do this by hand, rather than using software which automatically gives the values (and may be incorrect!).

2) Suppose you are trying to measure the mass of a rectangular block of metal. You measure the following three quantities:
length = 3.1 cm
width = 2.9 cm
height = 2.8 cm
You estimate that the ruler you are using to measure length has a precision of 0.03 cm. You are told the metal is aluminum, with a density of 2.70 g/cm^{-3}.
What is the mass, and random error in the mass? What is the percentage random error?

3) Suppose you are later told by the instructor that the ruler you were using isn't well calibrated; it might be as much as 1% too long, or too short. What kind of error is this? Approximately what percentage error would result in the measurement of the mass?

4) The error in (2) above was also about 1% in each length measurement. Are the percentage errors in the mass in (2) and (3) approximately the same, or different? Why?

5) An underwater diver looks up and sees the sun at an angle of 40 degrees to the vertical. A fisherman in a boat above him sees the sun as how many degree from the vertical? At what angle from the vertical does the horizon appear to the diver? What does the diver see at angles from the vertical greater than this?

6) Suppose a wave is described by the following formula:
$\Psi(x,t) = Ae^{i(30x-4000t)}$
where the quantities are in SI units. What are the phase velocity, wavelength, and period of the wave?