

EXTENDED ASSIGMENT (COUNTED AS QUIZ 14)
DUE MONDAY, 12-1-08

(1) Measuring the Angle of Inclination of the Sun

For this problem you are to measure the angle of inclination of the sun at THREE different times of day. To do this you are to use a small rod (such as a pencil, ruler or stick) and its shadow. The length of the rod and the length of its shadow is enough information to find the angle of inclination.

- a. Explain how to find the angle of inclination of the sun using a rod and its shadow.
- b. For each of the three measurements you make do the following:
 1. Record the time of day.
 2. Record what object you are using as your rod.
 3. Record the length of the rod.
 4. Record the length of the rod's shadow.
 5. Draw a diagram of this situation. Make sure you label the length of the rod and the length of the shadow, the angle of inclination and the sun.
 6. Write down the tangent of the angle of inclination.
 7. Write down the angle of inclination.

(2) An Equation for your Favorite Radio Station

- The signals you hear through the radio are electromagnetic waves. These sinusoidal waves are characterized by the number of cycles that occur each second. This is measured in frequency units called hertz, namely 1 hertz = 1 cycle per second. As Wikipedia describes, this is really a measurement of periodically varying angles. Thus we can write 1 hertz = 1 cycle/sec as approximately 6.283 rad/s. The frequency f of an electromagnetic wave measured in Hertz has a wavelength $\lambda = \frac{c}{f}$, where c denotes the speed of light ($c = 3 * 10^{10} cm/s$). Notice that λ has units of $cm/cycle$ so λ is precisely the length of one cycle, (i.e. the period). Once you have a wavelength you can write an equation for the sine function and plot the graph.
- a. Pick your favorite radio station.
 - b. Record the frequency.
 - c. Calculate the wavelength.
 - d. Write a function to describe this electromagnetic wave.
 - e. Graph and label this function.

(3) Graph the function $f(x) = \sin^2(x) + \cos^2(x)$