Physic 321 HW for Thursday, 11/19

Frequency modulation.

A problem with amplitude modulation is that it is susceptible to amplitude noise. If you ever try to listen to an AM radio station during a thunderstorm, you will know what this means. A solution is to modulate the frequency (or more commonly the phase) of the carrier as follows:

$$y(t) = A_c \cos\left(2\pi f_c t + \frac{A_m f_\Delta}{f_m} \sin(2\pi f_m t)\right)$$

Where fc is the carrier frequency, fm is the modulation frequency, Ac and Am are amplitudes and fdelta has to do with how much the carrier frequency is modulated from its nominal value.

Repeat the analysis we did today with the above function for fc=440 Hz, fm=10Hz Ac=1, Am=.1 , fdelta=fm.

Turn in to me: (by email) a commented .m file which produces:

1) A y vector from 0 to 6 sec with the above parameters
2) A plot of y as a function of time from 0 to 0.1 sec
3) An FFT of y
4) A plot of the FFT amplitudes as a function of real physical frequency.
5) Include at the appropriate places as comments in the .m file or on a separate sheet the following:
    a) Comments on how 2) is different from a similar plot for amplitude modulaton
    b) Interpretation of the FFT (note it is not as simple as the amplitude modulation case).