Fourier optics
HW 3

Problem 1

Using the FFTdemo.nb program as a guide, create a pulse function, put it on a grid, and calculate and plot the final pulse shape for pure 2nd, 3rd and 4th order spectral phase. Do this for a Gaussian and a rectangular pulses of FWHM of 10fs and 100fs and a center wavelength of 800nm. When plotting the temporal pulse shapes, determine the amount of each type of spectral phase that approximately triples the duration of the pulse.

The Taylor expansion of spectral phase is defined as:
$\phi(\omega) = \phi_0 + \phi_1(\omega - \omega_0) + \frac{1}{2}\,\phi_2(\omega - \omega_0)^2 + \frac{1}{3}\,\phi_3(\omega - \omega_0)^3 + \frac{1}{4}\,\phi_4(\omega - \omega_0)^4 + ...,$
so specifically, you'll be plotting the output pulse shape for different values of $\phi_2,\ \phi_3,\ \phi_4$, with $\phi_0 = \phi_1 = 0$.
It is conventional to represent the ϕ_n's in units of fs^n.

So you should make 6 plots:
τ = 10fs: ϕ_2, ϕ_3, ϕ_4
τ = 100fs: ϕ_2, ϕ_3, ϕ_4
for each plot, make it clear what value of phase you are using, and plot the x-axis in units of fs. To do this, set up a grid for the time points of your array, and do a ListPlot[Transpose[{timeLst / fs, data} }, Joined → True], potentially using PlotRange to zoom in to get a better display.