**HW2: Answer Key**

**Question:** If there were no signal decay, what would the linewidth be?

The line representing resonant frequency would be very (infinitely?) skinny. If the non-decaying isochromat is at our reference frequency, it will be on $f=0$. It is, however, possible that the non-decaying signal would be off-resonance, in which case we would find it at a different location (but still very skinny and very tall) on the frequency axis.

To invoke a few more rules about Fourier transforms:

- the amplitude of the Fourier transform at zero frequency would be equal to the mean of the time-domain signal (if you normalize by the number of points in the time-series, which isn’t shown below ...)
- the integral of the Fourier transform is related to the variance of the time-domain signal ... which is zero, so the integral of our infinitely-skinny line is 0 ... since it’s peak (amplitude) is equal to the time-domain mean, it’s width must be 0 for this to hold.