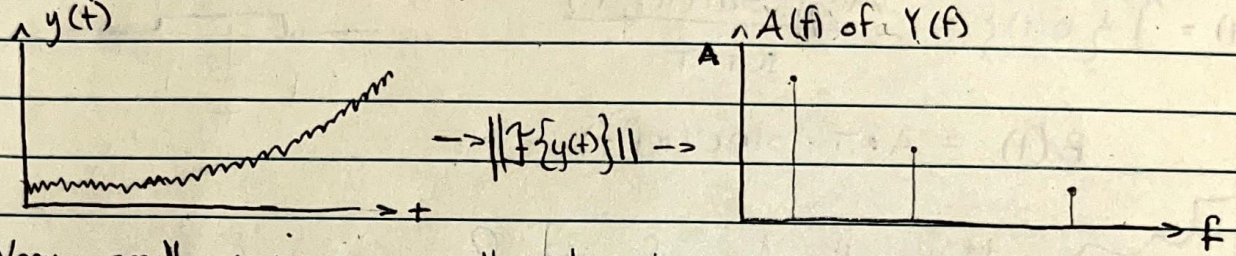
HW # 2 Cont.

2 i) Moana Loa

Each year is about one period, on a micro-scale the CO_2 concentrations rise in the winter and fall through the Summer. On a macro-scale, there is an exponentially increasing trend, while the micro-periodicies & amplitudes remain the same.



Very small waves on small intervals

There are Periodicies through different seasons each year, there are annual periodicies & a trend on an even longer scale. so there are many different frequencies, most of which are small on the scale of ~70 yrs.

2 ii) A N-point running mean smoothes data by taking the average at a particular point with its neighbors. This smooths irregularities & a sort of 'Noise'. It's like making a line of best fit out of the data itself. However, you don't Add or Remove anything, you just modify it, as a convolution or linear filter does.

A Convolution on the other hand, applies a transfer function to the input function to find the Sum of the inner product of the input & transfer function at everypoint. weighted with its neighbors.

2 iii) N = 48 is the lowest N that can smooth the data enough to get rid of Annual variation. If N=100, there may be signals filtered out that we dont want to filter. Nothing is particularly odd at the ends of the time series.

2 iv) Comparing the Convolution with the Gaussian & the Boxcar we can see a couple Big differences. The Gaussian smoothed data is rounded near the beginning & end of the data, both ends are concave down. Looking at the Amplitude spectrum we can see we primarily have lower frequencies. The first Noticable change looking at the boxcar, the rounded front & back are now sharp, discrete & near linear limbs. A closer look and the Scale of the Measured $[CO_2]$ is much greater, as well as the Amplitude Spectrum. The amplitude spectrums are identical, except that for the Boxcar, the limb rises earlier & steeper, possibly due to being more sensitive to Low-frequencies.