Week 1 Exercise (due Wed wk 2)

- Generate a time series of 1000 random numbers drawn from a normal distribution with standard deviation 1 (randn in Matlab).
- Create a time series 1000 time steps long, which is a sine wave of amplitude 1 and period 100 time steps.
- Plot random time series plus A times the sine wave, for A = 0.1,0.2,0.3... Note the value of A (A0) at which you think you can see a sine wave on top of the noise (no need to keep these plots)
- Now generate a matrix of 100 time series, each of 1000 random numbers drawn from a normal distribution of standard deviation 1.
- Calculate 100 standard deviations: the standard deviation of one of the random time series, of the average of the first 2, of the average of the first 3…. the average of all 100.
- Plot the standard deviation against the number x of time series averaged over. (keep this plot)
- Plot on top, $1/\sqrt{x}$ against x (in a different colour). Add a key to the plot, describing the curves.
- Using this information, together with your value of A0, work out how many time series you would have to average over in order to be able to see a sine wave of amplitude 0.05.
- Hand in a document containing your plot, and a few words giving your value of A0, and your calculation of the number of time series you would have to average over to see the sine wave with amplitude 0.05.
- Make yourself familiar with Matlab random numbers – we will use them a lot.