Pendulum Power Spectra

1) Since it looks like a single frequency you could time between peak, most accurate is fourier transform

2) based on my rough guess of the two lowest frequencies it seem consistent.

3). A power system of a chaotic system would have no well defined frequency (bottom Row)

Multidimensional Minimization w/ GSL Routines

1) you could make a class for starting points, step size + tolerance

2) The algorithm is looking at the gradiant of the function + the search direction are orthogonal, it minimizes their dot product

3) It worked for me, I added $+5(z-3)^2$, which gives minimas @ $(1, 2, 3)$ + 30

4) The algorithm is @ line 107,
gsl_multimin_fdfminimizer_conjugate_fr
- Steepest descent got me the closest value but w/ more itterations, conjugate_fr is better because our function is differentiable and it is more efficient

Nonlinear Least-Squares fitting w/ GSL Routines

1. The fitting function is a non-linear least squares fitting. σ_i is the standard deviation/error added to our exponential.

2. The Jacobian is a martix representing the derivative w/ respect to (A, λ, b). It is diagnolized and used to linearize the model function that is being minimized.

3. Yes I output it to a plt file + included "with errorbars".

4. The covariance matrix calculates the variance between points. The diagnal is the varience. It measures the change in the fitted parameter to the change in data. The uncertanties scale quadratically with noise as $\sigma_i^2 = C_{ij}\delta_{ij}$ (the diagnol of covarience matrix). Yes the time steps changes the error.

GSL Adaptive ODE Solver Revisited.

1). why start as string just to convert later?
- The virtual functions seem to have no point, the notes just say they are there.

2), yes they did.

3). In all cases it still acts like an isolated attractor but $V \to 0$ in less cycles than mu = 2.