Logan Maier

Optional:

1. I tried to get mine to work to no avail. For some reason it is not recognizing the aliases.

2. I added a phy480 alias the will navigate to the PHY480 directory, but it is not running.

Nan's and Inf's

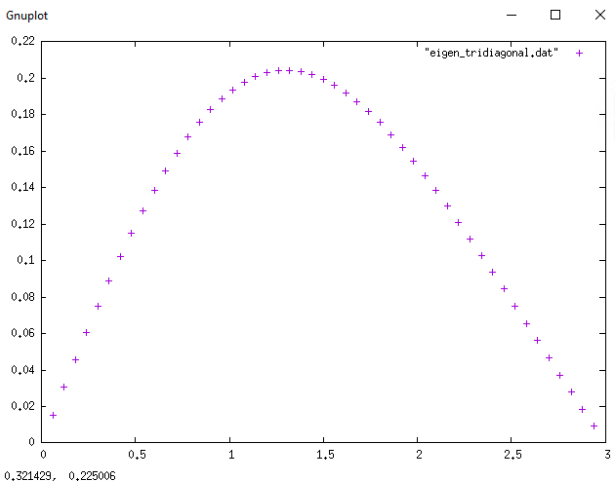
I predict it to be infinite, given that the code might stop after computing the parentheses. The code outputed it to be a nan.

Bound States by Matrix Diag.

1.

Rmax	N	E1	E2
1	10	9.86	38.2
2	20	2.7	10.1
3	30	1.68	5.10
4	40	1.51	3.78
5	50	1.49	3.52

2. @r = 0, the output should be zero. The function should be based on the ground states for this particular oscillator.



3. A reasonable Rmax should be 3.25, given that my graph above ends 3.

4.Per the results the relative error should scale with 1/(N^2)

5. When relating the slope to the second derivative to the slope I found, we can see a connection to the finite difference equation that has O(h^2) term. This term can be discovered when approximating the second derivative with our h term.

6. Per a discussion with my groupmate, when Rmax = 4 the plot should not have a very good fit.

Bound States from Diagonalizing the Hamiltonian in a Basis

1. Bound-States Energies for the square well parameters were found to be -14.53, -33.87, and -45.93
2. Tested
3. Out of all of the values, I believe the last value is the most reliable. I think this because the taylor expansion that solves for the value is the most drawn out and that is because this value is for the ground state.
4. The most effectively calculated values are the square well potential solely based on the complexity of the calculations that the coulomb potential.The calculations for the coulomb potential are complex due to how sensitive they are.
5. I have found that an optimum b value is around 0.2. This value was determined when a very steep down slope changes to a local minimum on the graph. B is this scenario is the width of the wave function so when you have a relatively small value for b, the ground state and square well comparison is good.
6. Fixing b to 0.2, plot included, I see that only big values induce a consistent linear relationship.
7. The matrix that is iterated over is a Hermitian Matrix which means that half of the matrix is the same as the other. By recognizing this, I can cut the number of iterations in half and can speed up the code by a factor of 2.