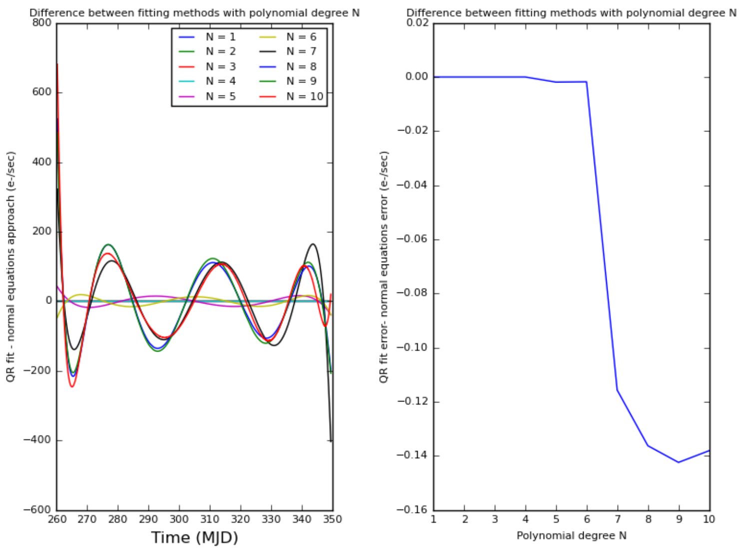
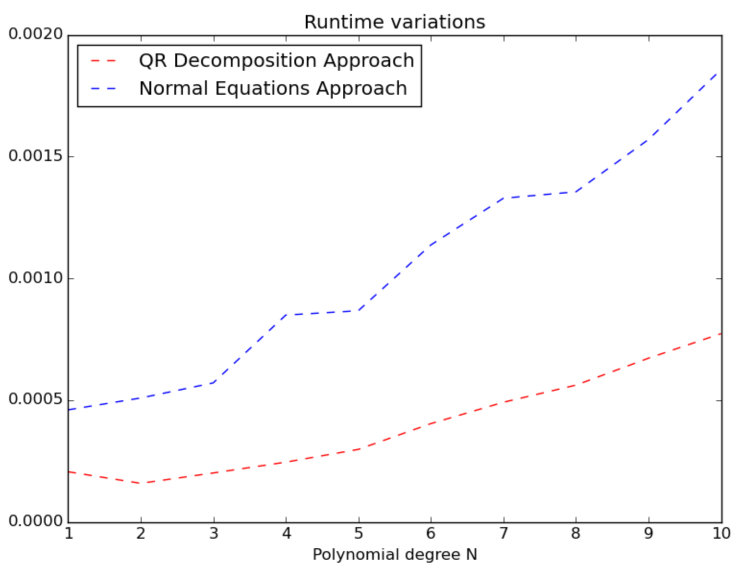
Problem Set 5: Detrending Kepler Data, part II

1. Done!

2. The fits begin to significantly diverge for polynomials of degree 4 or 5. As shown in the figure, the QR method becomes significantly better around polynomials of degree 6.



3. The times are different...but not too different.



4. Written (although the conjugate gradient doesn't work...yet.). Even shifting the polynomial by a linear offset, say the average of the data, is inordinately helpful as a first guess, and does not rely on previous solutions.

5. SOR is working, and finds a solution of [2.52977039e+05 -2.29478198e+02 2.88131707e-01] with ω = 1.9 at a tolerance of $1e-4$ in 41505 steps and 7 seconds for a preconditioned matrix. This compares with the QR and normal equations solutions, QR: [2.52984806e+05 -2.29529965e+02 2.88217303e-01] NE: [2.52984806e+05

-2.29529965e+02 2.88217303e-01] And now that I've realized I'm a total spacecase (I matched the keyword for Gauss-Seidel to the Jacobi method), Gauss-Seidel is also working, and finds a solution of at a tolerance of 1e-4 in 637581 steps and 3167 seconds for a preconditioned matrix (my computer is intolerably slow).

6. I changed x0 for the SOR method (as if you look at the time required for Gauss-Seidel on my laptop, I think you'll understand why I refuse to test this out...), and didn't find a significant difference. Sadly, my program also crashed on the plotting step...and I really don't want to rerun it, so I still only have the convergence plot for SOR.

   And as there was only one fit, there is not much to comment on, other than the fact that I would expect more movement over- and undershooting 0, so I worry for the veracity of this plot.