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Intro to Numerical Python
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1 Sample Problems

1. Stock Market Data
   - Find stock data for Google, Apple, and Microsoft for the last 6 months
     - try *finance.yahoo.com*
   - Save data in a Pandas DataFrame
   - Use Numpy to calculate derivatives
   - Plot stocks and derivatives using matplotlib/seaborn
2. Symbolic Taylor Series
   - Construct a function $TS(f, a, n)$ which returns the nth partial sum of the Taylor series for f about n
   - If you're feeling brave, try to make an interactive plot with a slider for n
3. Musical Scales
   - Create a Numpy array of a sine wave with amplitude 1 with a lot of samples
   - Use scikits-audiolab to play the sound
   - Experiment with other mathematical functions. What do they sound like?
   - Generate an A major scale based on A=440Hz with each note lasting 1 sec.
   - Repeat with antique musical scales (Just intonation, Pythagorean)
4. Compare with MATLAB / Mathematica / Fortran
   - What advantages/disadvantages does Python have?
   - Ease of coding?
   - Speed?
   - Language Features?
   - Documentation/community?
5. Look at some cool notebooks
   - Google *jupyter gallery of interesting IPython Notebooks*
   - Read through some interesting looking notebooks
   - Do you notice any interesting Python features?
   - Any Python syntax that you don't understand?
6. Explore Python Packages
   - Scikits: *https://scikits.appspot.com/scikits*
   - Numeric/Scietific: *https://wiki.python.org/moin/NumericAndScientific*