Physics 514 – FFT Exercise

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Due 10:00 AM, Thursday October 5 2017

1 Fast Fourier Transform

1.1 DFT

Write a function that implements the discrete Fourier transform. Show that, as a function of vector length, the computation scales as $O(N^2)$ (Show in log-log plot). What is the largest vector that you can transform within a second?

1.2 FFT

Write a function that implements the fast Fourier transform algorithm. Show that, as a function of vector length, the computation scales as $O(N \log N)$ (You can also show it in log-log plot, but remember to plot a reference curve as $N \log N$). What is the largest vector that you can transform within a second?

1.3 FFTW

Write a function that calls the built-in FFT interface (matlab), the scipy/numpy fftpack (Python), or the FFTW library for fast Fourier transforms (`http://www.fftw.org/`, C++ or Fortran). Show the scaling. What is the largest vector that you can transform within a second?

Homework Submission

Summarize your results and plots into one PDF file and also submit your codes to Canvas.