The purpose of this project is to reinforce your knowledge of the discrete-time Fourier series. Hopefully you will find the function you develop in last part of the project to be useful in checking analytical solutions of Fourier series problems (such as those found on problem set 4).

You are strongly encouraged to work in groups on this project. Each group will turn in a single writeup. The writeups must include all of the analytical (i.e., pencil/paper) work, Matlab plots and code, and relevant explanations. A list of guidelines for preparing the writeup of this project are given below. Failure to comply with these guidelines will result in a grade of ZERO for the project.

- The report must be neatly handwritten or typed, and all pages must be numbered.
- All plots must be neatly annotated with x-axis and y-axis labels and a title.
- When referring to plots in the text, you should do at least one of the following:
  - use figure numbers, e.g., “Figure 1 is a plot of the signal $x[n].$”
  - cite the page number they are on, e.g., “The figure at the top of page 4 is a plot of $x[n].$”
- All Matlab code must be well-documented and should be included in an Appendix at the end of the report.

1 Preliminaries

Work through the tutorial in Section 3.1 of *Computer Explorations in Signals and Systems* by Buck, Daniel, and Singer. You do not need to turn in the solutions for this part, but it should help you understand how to do the exercises in the following section. If you run into trouble with the tutorial, please see the instructor or the TA during office hours.

2 Discrete-Time Fourier Series Analysis and Synthesis

Do all of the exercises in Section 3.5 of *Computer Explorations in Signals and Systems* by Buck, Daniel, and Singer. Your writeup should include answers to all of the questions in the book and any other observations you make as you complete the exercises.

In the last exercise (Advanced Problem), you are asked to develop a function to compute the DT Fourier series coefficients of a periodic signal. Your function should include a comments section at the top of the file, similar to the ones found in built-in Matlab functions, e.g., look at the help for the `stem` function by typing `help stem` at the Matlab prompt.