ECE210A – Signals and Systems

# Assignment 05: Plotting

1. The Taylor series expansion for cos(x) has the following form:

$$cos(x) = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \ldots$$

   The n[th] order Taylor approximation of cos(x) is what we call the polynomial that contains all terms of this approximation up to $\frac{x^n}{n!}$ (i.e. $1 - \frac{x^2}{2!} + \frac{x^4}{4!}$ is the fourth order Taylor approximation of cos(x)). On the same set of axes, plot approximations of cos(x) up to the 20[th] order as well as cos(x) itself. (I promise this is less painful than it sounds).

   Hint: You can make a 10-by-something matrix to store all of your y-values where each row is assigned an approximation, then put your 2[nd] order approximation in the first row and use a for loop to obtain each approximation from the last, using MATLAB's `factorial()` function. There are no odd degree terms here, so I'm only looking for even order approximations.

2. Now make a figure with two subplots: one with a plot of cos(x) and the other with the plots of all of the approximations.

3. Plot the following surface:

$$S = [-2\pi, 2\pi]$$

$$Z = sinc\left(\sqrt{x^2 + y^2}\right), \qquad (x, y) \in S \times S$$

   Note: $sinc(x) = \frac{sin(\pi x)}{\pi x}$. MATLAB also has its own built-in sinc() function.