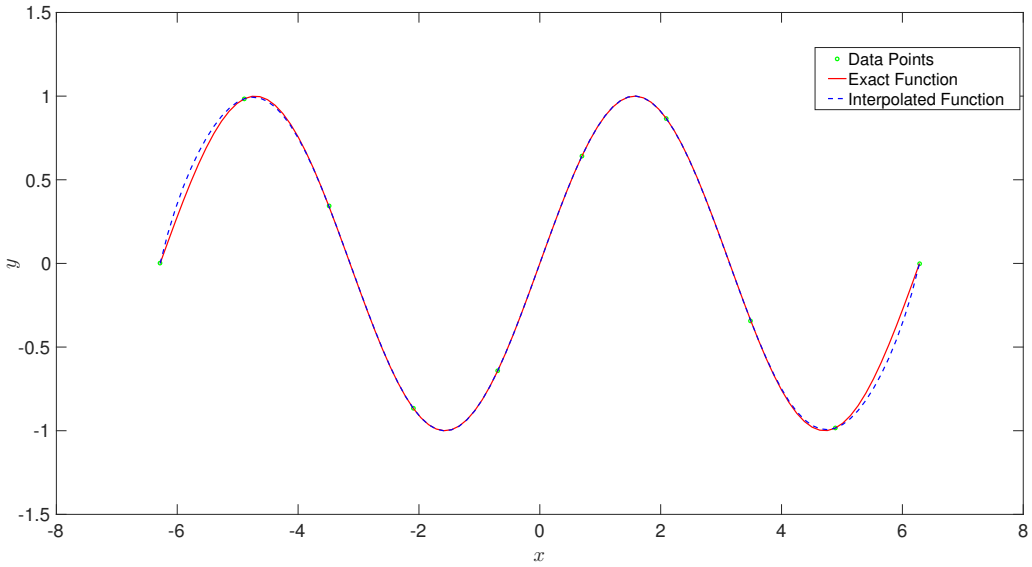
Lab 1

The goal of this project is to use Matlab and linear algebra to interpolate a function by a polynomial. You can feel free to use the Internet or any other resources you might have. The notes I posted online concerning how to use Matlab might be useful.

1 Task 1

1. Create a script file entitled "SineInterpYOURLASTNAME". The rest of the items should be completed within this script.
2. Create a vector of 10 equally spaced points on the interval $[-2\pi, 2\pi]$ and store these values in a vector d. **Hint:** The command linspace might be useful.
3. Create a vector of sampled function values f at the points in d for the function $f(x) = \sin(x)$.
4. Find the coefficients of a polynomial that passes through these values of the function. You will need to set up a system of linear equations and then invert the matrix. **Hint:** The Vandermonde matrices – which I asked you to read about – might be useful. You can use the Vander command in Matlab, but make sure you use it correctly.
5. Using a 100 points, in the same figure plot the function $f(x)$ in red, the interpolating polynomial as a blue dashed line, and the points where $f(x)$ and the interpolating polynomial intersect as circles. Be sure to properly label the axes. **Hint:** The command polyval might be useful for converting coefficients into polynomials.
6. Print out your code and your plot and submit it with your homework on 09/15/17.

For example, Your final plot should look something like:



2 Task 2

Repeat Task 1 on the intervals $[-4\pi, 4\pi]$ and $[-8\pi, 8\pi]$.

3 Task 3

1. Create a Matlab function that takes in two inputs:

   (a) 20 values of x (these do not need to be uniformly spaced)

   (b) 20 sampled values of a function at those values of x

   and plots the interpolating polynomial through those points on the interval $[-10, 10]$. The points do not need to be uniformly spaced. Be sure to plot the actual data points as green circles.

2. Apply your code to your favorite three functions.

3. Print your code along with your plots and submit it with your homework on 09/15/17.