CS/MA 321–001 Project #1

1. Complete the following MATLAB program for the Naive Gaussian Elimination to solve the linear system of equations $Ax = b$.

```
function x = Gauss_Naive(A,b)
% Function x = Gauss_Naive (A,b) finds the solution x of the linear system
% Ax = b by the Naive Gaussian Elimination, where the input A is an
% n-by-n matrix and b is a vector of length-n.
```

2. Select a reasonable value of n and generate a random $n \times n$ matrix A (using `A = randn(n,n)`). Define the vector b such that the solution of the system $Ax = b$ is a vector x with entries $x(j) = j$ for $j = 1, 2, \ldots, n$. Test the `Gauss_Naive` on this system.

3. Modify `Gauss_Naive` to include partial pivoting scheme (i.e., select the pivot row to be the one with the maximum pivot entry in absolute value from those in the leading column of the reduced submatrix).

```
function x = Gauss_Pivoted(A,b)
% Function x = Gauss_Pivoted (A,b) finds the solution x of the linear system
% Ax = b by Gaussian Elimination with partial pivoting, where the input A is
% an n-by-n matrix and b is a vector of length-n.
```

4. Test `Gauss_Pivoted` on the linear system from item 2. Then compare the residual vector $r = Ax - b$ of the solution computed by `Gauss_Pivoted` and `Gauss_Naive`. Which method is more accurate? (You can simply compare the norm of r computed by `norm(r)`.)