Numerical Linear Algebra
Weekly assignment #1

1. Write a Julia code that creates a random 500x500 system of linear equations. Solve it using the built-in LU with partial pivoting factorization, `F = lu(A)`. Check that the backward error is small. Report the performance in GFlop/sec.

2. Write a Julia code that creates a random 500x500 symmetric positive definite system of linear equations. Solve it using the built-in Cholesky factorization, `F = cholesky(A)`. Check that the backward error is small. Report the performance in GFlop/sec.

3. Write a Julia code for a recursive Cholesky factorization. Check that the backward error is small. Report the performance in GFlop/sec.

4. Write a Julia code that creates a random 500x500 nonsymmetric system of linear equations with prescribed condition number κ. Check that (1) backward error $\approx$ machine precision and that (2) forward error $\approx$ condition number $\times$ backward error.

5. Write a Julia code that performs LU with complete pivoting. Write the test code that goes with it.

6. Using the already written codes in the textbook compare the backward error for a random 500x500 nonsymmetric system of linear equations for LU with no pivoting, LU with partial pivoting, LU with rook pivoting and LU with complete pivoting.