In Class Problems

Review of Eigenvalues and Eigenvectors:

Steps to solve the eigen-problem for a square matrix A

$$Ax = \lambda x$$

First rearrange the definition of the eigenvalue-eigenvector pair to

$$(Ax - \lambda x) = 0$$

Next, factor the x on the right to get

$$(A - \lambda I)x = 0$$

Now observe that since $x \neq 0$ the matrix $A - \lambda I$ must NOT have an inverse. Therefore,

$$det(A - \lambda I) = 0$$

Solve the equation $det(A - \lambda I) = 0$ for all of the values of λ.

For each λ, find a solution to the equation $(A - \lambda I)x = 0$. Note that there will be infinitely many solutions so you will need to make wise choices for the free variables.

Practice Problem:

- Devise a way to demonstrate how the time to solve a large linear system Ax = b compares between the LU algorithm and the QR algorithm. Use plots to illustrate the comparison.
- Find Python's answer to the linear system using *np.linalg.solve(A,b)*
- Find the error between the two algorithms and the exact answer using *np.linalg.norm(x – exact)*.