1 Problems for everybody

1. Write a function in Matlab \( H = \text{hess}(A) \) that takes in an \( n \times n \) matrix and outputs a Hessenberg matrix. Your code should compute the Hessenberg matrix using Householder reflectors.

2. Write a function in Matlab \( \lambda = \text{QRAlg}(A) \) that take in a Hessenberg matrix and applies the QR algorithm until it converges. The output of this function will be a vector containing the eigenvalues of \( A \). You can use Matlab’s built in command \( \text{qr} \) for this algorithm.

3. Write a function in Matlab \( \text{vectors} = \text{InverseIt}(A, \lambda) \) that takes in a matrix \( A \) and approximations to its eigenvalues \( \lambda \) and applies Rayleigh quotient iteration to convergence. Your code should output a matrix \( \text{vectors} \) whose columns are the approximations to the eigenvectors generated by inverse iteration.

4. Write a program \( [V, \lambda] = \text{MyEig}(A) \) which outputs a matrix \( V \) containing the eigenvectors of \( A \) and \( \lambda \) a vector containing the eigenvalues of \( A \). Your code must use your three previous functions: \( \text{hess}, \text{QRAlg}, \text{InverseIt} \).

5. #25.1, #25.3, #27.1, #32.1

2 MST Graduate student problems

1. #26.1, 26.3(a).