EXERCISE 1

- Write a Matlab function `[x,mu]=power(A,maxit,tol)` that implements the power method to approximate the dominant eigenvalue of a matrix (use a random vector as initial guess). Test it on the matrix

  ```
  A = Q*diag(1:10)*inv(Q), with Q = orth(randn(10,10))
  ```

  Note that the spectrum of A is $\{1, \ldots, 10\}$. Modify the function to be able to plot the relative error $|\lambda_1 - \mu_k| / |\lambda_1|$ and also $(|\lambda_2/\lambda_1|)^k$, $k = 1, 2 \ldots$. What do you observe?

- Same as above, but test on the nonsymmetric matrix obtained using `Q = randn(10,10)`. Compare the results with the previous case.

- Write another function, `inverse_power`, that implements the inverse power method (use "backslash" to solve the linear system), and test it on the matrix used in the previous point to approximate $\lambda_9 = 2$ using

  $$\mu = 1.55, 1.65, 1.75, 1.85, 1.95.$$

  Plot the number of iterations required to converge vs. the value $|\lambda_9 - \mu| / |\lambda_{10} - \mu|$ and comment.