Homework 0: Due October 4, 2019

1. Using basic programming (for loops, while loops, and if statements), write a function in Matlab that takes in
   - column vector $v$ with $n$ components,
   - column vector $w$ with $n$ components,
and outputs the dot product $v \cdot w$.
   (a) Print out or write out your function to turn in.
   (b) Apply your function for the case when the vectors are $v = [1; 4; -2; 6]$ and $w = [8; -2; 1; 5]$. Print out the result and the number of flops taken.

2. Using basic programming (for loops, while loops, and if statements), write a function in Matlab that takes in
   - an $n \times n$ matrix $A$,
   - a column vector $x$ with $n$ components,
and computes $Ax$ and outputs both the result and the number of flops used.
   (a) Print out or write out your function to turn in.
   (b) Apply your function to a random $100 \times 100$ matrix and a $100 \times 1$ vector, but only report the number of flops since the resulting vector will be large. You can create a random matrix using $\text{randn}(100, 100)$, and a vector of all zeros using $\text{zeros}(100, 1)$. Also try this for matrices with $n = 200, 400, \text{and } 800$, and report the flops.

3. Using basic programming (for loops, while loops, and if statements), write a function in Matlab that takes in
   - an $n \times n$ matrix $A$,
   - an $n \times n$ matrix $B$,
and computes $AB$ and outputs:
   - the number of additions/subtractions used,
   - the number of multiplications/divisions used.
   (a) Print out or write out your function to turn in.
   (b) Apply your function to two random $100 \times 100$ matrices, but only report the number of adds and number of mults since the resulting matrix will be large. You can create a random matrix using $\text{randn}(100, 100)$, and a matrix of all zeros using $\text{zeros}(100, 100)$. Also try this for matrices with $n = 200, 400, \text{and } 800$, and report the number of adds and number of mults.