Homework #0

- Programming:

  1. Using basic programming (for loops, while loops, and if statements), write a function in Matlab that takes as input:

     – dimension n;
     – component i;

     and outputs the ith vector of the standard orthonormal basis (0's for all components except the ith component, which has a value of 1).

     (a) Print out or write out your function.

  2. Using basic programming (for loops, while loops, and if statements), write a function in Matlab that takes as input:

     – dimension n;
     – 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.
     (b) Apply your function to the case with vectors $[1; 4; -2; 6]$ and $[8; -2; 1; 5]$ and print out or write out the results.

  3. Using basic programming (for loops, while loops, and if statements), write a function in Matlab that takes as input:

     – dimension n;
     – $n \times n$ matrix A;
     – column vector x with n components;

     computes Ax and outputs the number of flops used.

     (a) Print out or write out your function.
     (b) Apply your function to the case with a 100×100 random matrix and vector and print out or write out the results. Do the same for 200×200, 400×400, and 800×800.

  4. Using basic programming (for loops, while loops, and if statements), write a function in Matlab that takes as input:

     – dimension n;
     – $n \times n$ matrix A;
     – column vector x with n components;

     computes Ax using column-oriented matrix-vector multiplication, and outputs the number of flops used.

(a) Print out or write out your function.

(b) Apply your function to the case with a 100×100 random matrix and vector and print out or write out the results. Do the same for 200×200, 400×400, and 800×800.

5. Using basic programming (for loops, while loops, and if statements), write a function in Matlab that takes as input:

   - dimension n;
   - $n \times n$ matrix A;
   - $n \times n$ matrix B;

   computes AB and outputs:

   - the number of additions/subtractions used;
   - the number of multiplications/divisions used;

   (a) Print out or write out your function.

   (b) Apply your function to the case with a 100×100 random matrix and vector and print out or write out the results. Do the same for 200×200, 400×400, and 800×800.