

Problems 1 and 2 of this homework will ONLY be graded for completion (10pts each). You may wish to read chapters 6.1-6.3 of the textbook.

You can use, as template, the example we did in class. Upload your solutions to these two problems to Gradescope.

Problem 3 is a syllabus quiz, which you can find in Canvas under “quizzes”. It is worth 10pts and graded automatically by Canvas.

Q1. (10 pts) Write a MATLAB function with inputs

- a matrix  $A$  of size  $m \times n$ ,
- a vector  $x$  of size  $n \times 1$ ,

and which outputs the product vector  $Ax$  (note that the size of this vector should be  $m \times 1$ ).

To get the dimensions of the matrix  $A$ , you can use

```
[m,n] = size(A);
```

similarly to how we got the length of the vector  $u$  as

```
n = length(u);
```

Here the semicolon suppresses output.

Your code should check that the sizes of the inputs are right and then do the multiplication using two nested “for” loops.

- Run your code on  $A = \text{rand}(9)$  and  $x = \text{rand}(9, 1)$  (the command “rand” produces a random matrix). Compare the output of your function to the result when you type  $A * x$  into MATLAB (the results should be the same!).
- How many floating point operations (additions and multiplications) does the code use? Find a **formula** in terms of  $m$  and  $n$ . (Similar to how we found that a vector-vector multiplication takes  $2n$  (or  $2n-1$ , depending on how you count) operations, where  $n$  is the vector length.)

Q2. (10 pts)

Write a MATLAB function with inputs

- a matrix  $A$  of size  $m \times n$ ,
- a matrix  $B$  of size  $n \times p$ ,

and which outputs the product matrix  $A \times B$  (note that the size of this matrix should be  $m \times p$ ). Your code should check that the sizes are right and then do the multiplication using three nested “for” loops.

- a) Run your code on  $A = \text{rand}(9, 4)$  and  $B = \text{rand}(4, 6)$  (the command “rand” produces a random matrix). Compare the output of your function to the result when you type  $A * B$  into MATLAB (the results should be the same!).
- b) How many floating point operations (additions and multiplications) does the code use? Find a formula in terms of  $m$ ,  $n$ , and  $p$ .

**Q3.** (10 pts) Go to Canvas quizzes and take Quiz 0, the “Syllabus quiz”. Note that you have 10 attempts to get it right and no time limit (except you must be done by Friday, October 6, at 11:59pm).