Homework 01

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Work in groups of two.

Go through the MATLAB chapter posted online, do some of the examples/problems in each section. Make sure you cover vector/matrix creation, matrix indexing, and defining functions. Make sure you know how to solve the following problems (do not submit):

1. Know how to look up the help for a specific function (for example `help length`)
2. Compute $\sqrt{\pi}$ and show it with 16 digits.
3. Create a row vector u with entries 1, 7, and 15.
4. Create a column vector v with entries $1, 2, 3, \ldots, 10$ (now without typing out all numbers).
5. Create the vector w with entries sin(1), sin(2), … sin(10) by using v and the fact that sin() can operate on arrays.
6. Create a vector with the even numbers from 2 to 100 and then add 1 to the first, third, 5th, etc. entry. Do not use a loop.
7. Test the difference between `length(x)`, `size(x)`, and `size(x,1)` for a row vector, a column vector, and a matrix.
8. Look up the function `reshape` and use it to create a 8x8 matrix with entries $1, 2, 3, \ldots, 64$ (row by row) in a clever way.
9. Implement $f(x) = 1 + x^2$ as an inline and a .m function, test how to call them, and read up how to pass them to another function.

Then proceed with the more difficult problems on the next page (your actual homework).

Write the solution to each problem into a .m file. You should have: hw01q1.m, hw01q2.m, printstuff.m, nonsense.m, hw01q4.m. Include both of your names as a comment in the first line of each file and submit your files through canvas.

1. Write an expression that outputs a vector with the entries

$$1+\frac{1}{2}, 1+\frac{1}{4}, 1+\frac{1}{8}, 1+\frac{1}{16}, \ldots, 1+\frac{1}{512}$$

   without typing out all these numbers (you do not need to write a `for` loop!).

   Your .m file should contain a single expression in a single line.

2. You are given a matrix A. Write an expression that extracts the last column but without the first row and outputs it as a **row** vector. You can test this with the matrix `A=magic(5);` and `A=magic(6);`.

   Your .m file should start with `A=magic(5);` and then contain a single expression. Yes, this is not something you would do in practice later on.

3. Write a (pretty useless) function `function printstuff(func,values)` that takes a function handle `func` of a function that takes one argument and returns one number, evaluates that function at the points given in the vector `values`, and prints the values to the screen. The output should look like this:

```
  >> myfunc = @(x) 1+x^2;
  >> printstuff(myfunc,[1,4,3]);
Function evaluated at 3 points:
point 1.000000 has value 2.000000
point 4.000000 has value 17.000000
point 3.000000 has value 10.000000
```

   Note: Of course this function should work for any number of `values`.

   Hint: Use a `for` loop and `fprintf` (look up `fprintf` in the MATLAB help).

4. Write a function `function y=nonsense(x)` defined in a .m file that should return 0 if x is odd and 1+x otherwise (so `nonsense(4)` is 5, while `nonsense(11)` is 0). Now test this function by using `printstuff` from the question above using the values `[4,11,15,20]` (this is part 1 of hw01q4.m).

   Finally (this is part 2, also in hw01q4.m) create a plot for x from 0 to 15 of the function `nonsense`. Change the style so that the line is dashed and the points are marked with a symbol. Include a legend, a title, and the axis labels 'x' and 'nonsense'.

   Hint: look up `mod` in the MATLAB help. You will probably need a for loop to evaluate `nonsense` for plotting, because `nonsense` only operates on a single number.