

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Collaborators: \_\_\_\_\_

(Collaborators submit their individually written assignments together)

Question:	1	2	3	4	5	Total
Points:	10	20	20	10	10	70
Score:						

Instructor/grader comments:

**Course logistics**

1. (10 points) Select one:

- I've created a new gitlab account on the **UConn's** GitLab server

When creating your gitlab account, use your UConn email address for the registration. Chose a 'human readable' user name. (The 'name' part of your UConn email address is the suggested choice for the user name.)

My gitlab user name: \_\_\_\_\_

- I've deleted my old homework project from my existing gitlab account

Sign and date here: \_\_\_\_\_

Upload your homework 1 as following:

1. Use gitlab web interface to create a new project called **hw01** (the name must be exactly as shown)
2. Use gitlab web interface to add *README.md* file and edit it to add some meaningful content, e.g. the explanation of your reasoning while writing the code
3. Use gitlab web interface to **upload** your matlab code to your project. Upload **all** matlab files that are required to run your code, including the files written in class or provided by the instructor.
4. Share the project with the instructor (gitlab user name m3511\_19s\_in) and the TA (gitlab user name m3511\_19s\_ta) and grant them **Reporter** privileges.

**Fourier transform**

2. Find the DFTs of the vector  $\mathbf{x} = [0, 1, 0, 1]$ :

(a) (5 points) Write down the Fourier transform matrix  $F_4$ . Use the Euler formula  $e^{i\phi} = \cos \phi + i \sin \phi$ , if needed, to evaluate the exponents of complex numbers.

(b) (5 points) Find the vector  $\mathbf{X} = F_4 \cdot \mathbf{x}$ . Show all your work in the space below.

(c) (5 points) Write down the matrix of the inverse Fourier transform  $F_4^{-1}$ .

(d) (5 points) Find the inverse Fourier transform of the vector  $\mathbf{X}$  that you calculated earlier. Verify that you recovered the original vector  $\mathbf{x}$ . Show all your work.

**Matlab**

3. (20 points) Use the code that we developed in class (functions `mynaivedft(x)` and `myradix2dft(x)`) and write the similar code for the inverse Fourier transforms. Call your functions `mynaiveinvdft(x)` and `myradix2invdft(x)`. Test your code by conducting a direct Fourier transform of a random vector of length  $n = 512$  followed by an inverse Fourier transform of the result, and verifying that the original vector is recovered.
4. (10 points) Use the script `dfttiming.m` that we developed in class and write the similar code to compare the performance of your two code for the inverse Fourier transform. Call your script `invdfttiming.m`. Write your conclusions in the gitlab's README.md file.

**Gitlab**

5. (10 points) Create a gitlab project called **hw01** (name it exactly as shown). Upload **all** required matlab code and create your readme file. Share the project with the instructor and the grader.