
Mini Project 1: MATLAB Introduction (3 pages)

Rule 1. Read Handout 2; you submit an M-file `p1_WXYZ.m`, where `WXYZ` are the last 4 digits of your NJIT ID. Observe capitalization. Use an underscore `_` instead of a dash `-`; **SUPPRESS output for all of your MATLAB commands.** If you submit a `.mat` file you get automatically a 0; if you submit a file with a different file-name than the one instructed, you also receive a 0.

Rule 2. Send an email (with subject line as specified in Handout 2) to

- the instructor `alexg+cs101@njit.edu`,
- the grader whose email address will be posted after Jan 31 on the course Web-page, and
- to yourself to make sure that everything went fine with the transmission of your mail.

Rule 3. It is imperative that you fully conform to Rules 1 and 2. Testing will be done by running a MATLAB program; If you deviate from these rules points will get deducted. Observe variable names and capitalization or you may not get any points at all.

Due Date: Before **noon time of Wed Feb 25, 2015.** (Penalties in Handout 1.)

1 Part A: Warm-up (15 points)

You will create a text-based M-file named (Rule 1) `p1_WXYZ.m` `WXYZ` are as specified in Rule 1. **Always use semicolons to suppress output; 10 points deducted for every missing semicolon.**

1. First line. The first line of the M-file will contain in the form of a MATLAB comment the name of the file in question i.e. `p1_WXYZ.m` with the first character, the `p`, separated with three (3) spaces from the MATLAB comment symbol.

2. Second line. The second line would contain in the form of a MATLAB comment line your first or other given names in lower case (all characters), followed by your last name fully capitalized (all characters). Then include the last four digits of your id, eg `WXYZ`. Exactly three (3) space characters inbetween any two of the words or the comment indicator of MATLAB or `WXYZ`.

3. Third-Seventh lines. The third line will be empty. (Note the difference between an empty line like this and an empty comment line.) For 3.1-3.4 use 4 lines (fourth through seventh).

The remaining lines of the MATLAB file are described in the following questions 3.1-3.4 and 4-26. Pay attention to the details. Variables have names starting with a `v` followed by a number. Do not change names or capitalization. Grading will be done automatically for most problems. **Use brief MATLAB array operators rather than explicit listing of matrix or vector elements. Thus If you need to create a row vector `v` containing 1,2,3,4, a solution that is along the lines `v= 1:4` is a correct one; writing something like `v = [1 2 3 4]` will get you 0 points.**

3.1 Variable v1. In one line, create string variable `v1` and assign to it as value a string consisting of your last name in capital (upper) case followed by a single space, followed by your first name in lower case. (If you have more than one given/first-names use a dash to connect all those given names.)

3.2 Variable v2. In one line, create variable `v2` and assign to it the last four digits of your NJIT id in the form of a string.

3.3 Variable v3. In one line, create variable `v3` and assign to it the last four digits of your NJIT id in the form of a 16-bit integer.

3.4 Variable v4. In one line, create variable `v4` and assign to it the last four digits of your NJIT id in the form of a 32-bit unsigned integer.

2 Part B: Playing with numbers and vectors (42 points)

There are no variables `v5` through `v13`. The next variable to be created will be `v14`.

4. Create a MATLAB variable `v14` that is assigned the value `14.1414`.
5. Create a MATLAB variable `v15` that is assigned the value `15.15` and be of datatype `single`.
6. Create a MATLAB variable `v16` that is assigned the value $\log(16e^6\pi^{16/6})$, where π is the ratio of the circumference to the diameter of a circle, and e is Euler's number.
7. Create MATLAB variable `v17` that is assigned the value 17.17×10^7 .
8. Create MATLAB variable `v18` that is assigned the value $18^\pi / (18 * e^{18})$. (See 6 above for definitions of π , e .)
9. Create MATLAB vector variable `v19` that is assigned the values $1/2, 1/3, 1/4, 1/5, \dots, 1/10000$ in that order (it is a sequence of 9999 terms).
10. Create vector `v34` = `[1:2:80]`, and create MATLAB variable `v20` whose value is the elements of `v34` after 1 is subtracted from each one of the latter's values.
11. For the same vector `v34`, create a MATLAB variable `v21` whose value is the square of each one of the elements of `v34`.
12. For the same vector `v34`, create a MATLAB variable `v22` whose value is the cubic-root of each one of the elements of `v34`.
13. Create a MATLAB variable `v23` whose value is $0, 1/2, 2/3, 3/4, 4/5, \dots, 99/100$.
14. Use the colon operator to create row vector variable `v24` such that

$$v24 = [20 \quad 13 \quad 6 \quad -1 \quad -8 \quad -15 \quad -22 \quad -29].$$

15. Using the colon operator as needed, create vector variable `v25` such that

$$v25 = \begin{bmatrix} 11 \\ 24 \\ 39 \\ 56 \\ 75 \end{bmatrix}$$

16. Create column vector variable `v26` such that it includes all the numbers from -2 to 2 of the appropriate step increment so that

$$\text{transpose}(v26) = [-2 \quad -1.7500 \quad \dots \quad 1.7500 \quad 2.0000].$$

17. Create vector variable `v27` such that it becomes a string of length 27 whose value is shown below. The string starts with the I, has one space between two consecutive words, ends with exclamation marks.

$$v27 = \text{I like MATLAB a lot!!!!!!!!}$$

3 Part C: Playing with matrices (28 points)

18. Create vector variable `v28` such that it becomes a string of 5 characters containing NJIT President's last name. The first character should be in capital and the remaining ones in lower case.

19. Create a matrix variable `v29` with 3 rows each row containing NJIT President's last name. The first character should be in capital and the remaining ones in lower case.

20. Create a MATLAB variable `v30` that computes using MATLAB functions the number of 2s of matrix `2*ones(300,300)+4*eye(300)`.

Use only vector operations do not input matrix elements explicitly in the remainder. You may define auxiliary variables starting with `abcd.WXYZ_` and then using a single digit of your choice: be reminded that `WXYZ` are the last four digits of your NJIT ID. You will be penalized for the use of such variables however if you use one too many. You are not allowed to use MATLAB `reshape`, if you are tempted to or functions NOT covered in class.

21. Create matrix variable `v31` such that it is a 32×32 matrix of 31s. (You are not allowed to type 31 more than twice counting also the one in `v31`.)

$$v31 = \begin{bmatrix} 31 & \dots & 31 \\ \vdots & & \vdots \\ 31 & \dots & 31 \end{bmatrix}$$

22. Create matrix variable `v32` such that it is a 10×10 matrix of the numbers from 1 to 100 step 1 in column major order as shown below. (You may not use more than two times the colon operator.)

$$v32 = \begin{bmatrix} 1 & 11 & \dots & 91 \\ 2 & 12 & \dots & 92 \\ \vdots & \vdots & \vdots & \vdots \\ 9 & 19 & \dots & 99 \\ 10 & 20 & \dots & 100 \end{bmatrix}$$

23. Create matrix variable `v33` such that it is a 10×10 matrix of the numbers from 1 to 100 step 1 in row major order as shown below. (You may not use more than two times the colon operator.)

$$v33 = \begin{bmatrix} 1 & 2 & \dots & 10 \\ 11 & 12 & \dots & 20 \\ \vdots & \vdots & \vdots & \vdots \\ 91 & 92 & \dots & 100 \end{bmatrix}$$

24. You have already created matrix variable `v34`, haven't you ?

25. Create matrix variable `v35` such that it is initialized to the row-vector `v24`, and then use a single assignment statement to change at once the following three of its values as shown:

$$v35(1) = 10 \quad , \quad v35(4) = 40 \quad , \quad v35(7) = 70 \quad ,$$

26. Create matrix variable `v36` such that it is set to the sum of the values of the elements of `v19` plus 1 minus the log of the number of elements of vector `v19` incremented by 1 (note: you take the log after you increment by one). The result is an approximation to the value of Euler's constant γ which is approximately 0.5772156649... (do not expect more than 2-3 decimal digits of precision though...)

Grading. Most (but not all) of the grading would be performed by a program `p1_chck.m` which is an M-file. To use it (when you have access to it), read the directions at the top of it. Our M-file does most but not all of the grading: it won't check lines 1-5. The grader will do it! But your actual grade would be within 10 points of the reported grade.