A04 · MATLAB Calculations

Introduction

Assignment Goals

This assignment allows you to practice using MATLAB documentation to discover built-in functions and perform calculations on any array type. You will execute commands inside the MATLAB Command Window, store variables in the Workspace, and learn how to use various built-in functions.

Successful Completion

This assignment has two (**2**) problems. The deliverables list contains everything you are expected to submit.

Submit all deliverables to the Gradescope online assignment **A04 – All Problems**		
Problem	**Type**	**Deliverables**
Problem 1: Built-in Function Skills	Individual	☐ Requested information and solutions
Problem 2: Calculation Skills	Individual	☐ Requested information and solutions ☐ Image file ○ A04_equationFig_*login*.png

1. Read *Notes Before You Start*, on **Page 1**.
2. Read each problem carefully. You are responsible for following all instructions within each problem.
3. When your work is complete, confirm your deliverables are submitted to Gradescope.

Learning Objectives & Grading

This course uses learning objectives (LOs) to assess your work. You can find a list of the course LOs on Brightspace (Content > Key Course Info > Learning Objectives).

Review the assignment grading for each problem in this assignment, which starts on **Page 5**. This outlines how your work will be graded for each problem.

Notes Before You Start

Problem Generator File (A04_skills.p)

In the assignment folder, you will see a file named **A04_skills.p**. This is a MATLAB function file that generates problem information for each skill problem in this assignment.

To use this file you must do the following:

1. Open MATLAB and identify your current folder.
2. Download **A04_skills.p** into your current MATAB folder (this can be on your personal computer or in your own MATLAB Drive folder).
3. Once the .p file is in your current folder, you can use it like a built-in function. The file requires two inputs.
    a. Input 1: Your 8-digit PUID number (you can leave off the leading 00s)
    b. Input 2: the problem number

For example, if your PUID is 12345678 and you want to open problem 1, you will enter the following instruction at the Command Line in the Command Window:

```
>> A04_skills(12345678,1)
```

4. When you run this command, you will get information displayed to the Command Window, to a figure window that opens separately, or both. No information will be stored in your Workspace when you use the **A04_skills.p** function.
5. **You cannot open the p-code file**; you can only run it with the specified inputs.

Need help using the problem generator file? Check out the A00 Activity from Class 1B here to see fully-worked examples.

Gradescope

You will submit all your deliverables to Gradescope for grading.

Gradescope has several types of assignment formats, and the submission process varies depending on the format. The most commonly used assignment formats in First-Year Engineering are:

- "programming assignment" where you submit files, usually code and supporting files;
- "online assignment" where you submit answers and/or files within a Gradescope interface; and
- "homework assignment" where you submit an entire assignment as one PDF file.

An ENGR 132 homework assignment may have multiple Gradescope assignments, depending on the type of problems assigned. For **A04**, you will have only one Gradescope submission assignment that is the "online assignment" format. The instructions on Page 1 of each homework will tell you which Gradescope assignments to use for the assigned problems.

Accessing Gradescope for the first time in ENGR 132?

1. Log into Brightspace and open your ENGR 132 course.
2. Click **Content** from the black menu ribbon at the top of the page.
3. Click **Gradescope** from the Table of Contents in the left sidebar.
4. Click the top item, which is a link that will open Gradescope within Brightspace.
5. Select the assignment you are ready to submit.

Opening Gradescope through Brightspace will auto-enroll you in the Gradescope course for your section.

You can access Gradescope through Brightspace throughout the semester.

Need help with Gradescope?

Navigate to the same Brightspace location as above and view the links and documents in Gradescope Help.

Problem 1: Built-in Function Skills

Introduction

This problem will test your knowledge of MATLAB's built-in functions. You will use MATLAB's Command Window and help documentation to search for functions that meet a specified need. You will use some of those functions to write MATLAB commands.

Problem

Answer six (6) questions about MATLAB built-in functions. Make sure **A04_skills.p** is in your current MATLAB folder (see the *Notes Before You Start* section above).

You will call **A04_skills.p** six times. Use the function calls below in the Command Window prompt to generate each question's instructions.

Q1.1: `>> A04_skills(PUID, 1.1)`

Q1.2: `>> A04_skills(PUID, 1.2)`

Q1.3: `>> A04_skills(PUID, 1.3)`

Q1.4: `>> A04_skills(PUID, 1.4)`

Q1.5: `>> A04_skills(PUID, 1.5)`

Q1.6: `>> A04_skills(PUID, 1.6)`

Remember to replace PUID with your 8-digit Purdue University ID number (leave off the leading 00).

General Instructions

1. Enter your function call for the desired question in MATLAB Command Window prompt.
2. Read the written instructions that appear in the Command Window. Use MATLAB to find an answer to the question.
3. Submit your work in Gradescope:
    a. Open Gradescope > **A04 – All Problems** and find the set of boxes that belong to the question you want to submit. Enter the required information along with your answer:
        - **Function call**. Copy the command that you entered at the command prompt to call the function and paste the full command into this box. Be sure your PUID is included.
        - **Instruction text**. Copy the instruction text that is displayed in the Command Window. Paste it into this box. Include all text provided.
        - **Solutions**. Enter your solution(s). Follow any additional instructions provided.
    b. When you have entered all the required information for the question, click the **Save Answer** button.
4. Repeat Steps 1-3 for the next question until you have completed all six questions.

Note: When you are given a vector or matrix in the instruction text, you can enter the array into your MATLAB Workspace by copying and pasting the array, with its variable name, into the prompt in the Command Window.

Problem 2: Calculation Skills

Introduction

Element-wise operations are powerful and useful mathematical commands within MATLAB. They make your code more efficient and save you time as a programmer. You will demonstrate the difference between scalar operations and element-wise operations in this problem by solving mathematical equations that require both operations.

Problem

An elementwise operation occurs when each element in one array performs the stated operation with ***only*** its counterpart in the next array. The terms *array operations*, *element-wise operations*, and *element-by-element operations* all mean the same thing in MATLAB and course documentation.

This problem has two parts. Part A will ask you to solve an equation using given scalar values. Part B will ask you to solve an equation using vectors. You need MATLAB with **A04_skills.p** in your current folder.

Instructions

1. Type this command into the MATLAB Command Window prompt:

   ```
   >> A04_skills(PUID, 2)
   ```

   Remember to replace PUID with your 8-digit Purdue University ID number (leave off the leading 00).
2. This problem displays information for Part A and Part B in the Command Window and in a new figure window.
   a. Read the written instructions that appear in the Command Window.
   b. View the equations that are displayed in the figure window.
3. Add the variables from the instruction text to your Workspace. Perform the calculation using the variable names, do not hardcode the numeric values into the expression. Do not change the order of the equation terms or attempt to simplify the equation before doing the calculation.
4. Save the figure as an image file.
   a. In the figure window, click **File > Save As**.
   b. Select the location where you want to save the file. Choose a location that is easy for you find.
   c. Change the file format to Portable Network Graphics (PNG) and name the file **A04_equationFig_*login*.png**, where you replace *login* with your Purdue career account login name.
5. Submit your work in Gradescope:
   a. Open Gradescope > **A04 – All Problems** and find the set of boxes that belong to **Q2** you want to submit. Enter the required information along with your answer:
      - ☐ **Function call**. Copy the command that you entered at the command prompt to call the function and paste the full command into this box. Be sure your PUID is included.
      - ☐ **Instruction text**. Copy the instruction text that is displayed in the Command Window. Paste it into this box. Include all text provided.
      - ☐ **Instruction figure**. Click the "Select file(s)" button. Navigate to the location of your saved image file. Select the file and click the "Choose" button.
      - ☐ **Solutions**. Enter your solution(s). Follow any additional instructions.
   b. When you have entered all the required information for the question, click the **Save Answer** button.

Note: When you are given a variable in the instruction text, you can enter it into your MATLAB Workspace by copying and pasting the full variable assignment into the prompt in the Command Window.

Confirm Your Submission

You should save your progress on each question in a skills problem so that you do not lose your progress. To confirm your answers, click the **Submit & View Submission** button at the bottom of the questions in Gradescope (or select the assignment name from the Gradescope dashboard, if you have already saved your answers and navigated away from the original submission page).

Confirm that your submission for **A04 – All Problems** includes

- ☐ The function call and instruction text for each skills question;
- ☐ The expected deliverables and results;
- ☐ Correct file names for any submitted files, including your Career Account login at the end where required.

You can resubmit your work as many times as you want, but only the final submission will be graded.

Assignment Grading

Your work will be graded using the evidences given in the course learning objectives. Familiarize yourself with the LOs and their evidences listed for each problem, which are below.

Problem 1

LOs: PC05, MAT03

Problem 1 is worth 6 points, where each question is 1 point. There is some partial credit on Questions Q1.1 – 1.5. The partial credit may be more specific than what is in the course LOs and is based on evidence MAT03 (1).

You must meet the PC05 expectations for each question. If you do not meet these, you will lose additional credit.

Evidence	Penalty
PC05 (1)	Lose full credit on question
PC05 (2)	Lose 25% of full credit on question
PC05 (3)	Lose 25% of full credit on question
PC05 (8)	Lose 10% of full credit on question

Problem 2

LOs: PC05, MAT03

Problem 2 is worth 4 points, where each part is worth 2 points. There is some partial credit on each part. The partial credit may be more specific than what is in the course LOs and is based on evidences MAT03 (1) – (4).

You must meet the PC05 expectations for this problem. If you do not meet these, you will lose additional credit.

Evidence	Penalty
PC05 (1)	Lose full credit on problem
PC05 (2)	Lose 25% of full credit on problem
PC05 (3)	Lose 25% of full credit on problem
PC05 (4)	Lose 10% of full credit on problem
PC05 (8)	Lose 10% of full credit on problem