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- Report should be written in English.
  - Your report should include intermediate steps, necessary discussions as well as the Python codes and results.
  - Submit your report to Blackboard before deadline
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1. **System Installation:** In this class, we will be using Python and Drake (a robot simulator) in class, and also for homework and projects. Drake runs on Mac-OS or Ubuntu. If you do not have a Mac computer, please install Ubuntu either directly on your computer or through Windows Subsystem for Linux (WSL). Some instructions are given in the following video.

<https://www.bilibili.com/video/BV1Hb4y1U7fo/>

You don't have to follow all the steps in the video. As long as you have a working Ubuntu system and Python environment, you are good to go. For this homework, please attach your Ubuntu (or macOS) snapshot, and your Python coding environment.

2. **Python Basics:** Please carefully study the Python tutorial posted on the class website, and complete the following questions
  - (a) Print the length of the string "Hello, Python!".
  - (b) Create a 'while' loop that sums the numbers from 1 to 100.
  - (c) Make a program that prints the fruits in the set one by one: `fruit_list = ['apple', 'pair', 'banana', 'orange', 'watermelon']`.
  - (d) Define a class which has the two methods below:
    - `getString()`: to get a string from console input.
    - `printString()`: to print the string in upper case.

Then write a simple program to test the class methods.

3. **Linear Algebra with Python** In this class, we will have a lot of work to do with linear algebra. It is important to use Python to complete the linear algebra task. Let's get familiar with it now.

$$A = \begin{bmatrix} 1 & -2 & 4 \\ 1 & -1 & 1 \\ 1 & 0 & 0 \\ 1 & 1 & 1 \\ 1 & 2 & 4 \end{bmatrix} \quad B = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 2 & 3 \\ 1 & 2 & 3 \\ 1 & 2 & 3 \end{bmatrix} \quad b = \begin{bmatrix} 0 \\ 0 \\ 1 \\ 0 \\ 0 \end{bmatrix}$$

- (a) Print the two matrices  $A$  and  $B$ .
- (b) Print the second row of  $A$  and the third column of  $B$ .
- (c) Print the results of  $A + B$  and  $A - B$ .
- (d) Construct a new  $5 \times 6$  matrix  $[A, B]$  by appending  $B$  to the right of matrix  $A$ .
- (e) Compute  $A^T B$

#### 4. Matplotlib

- (a) Plot a unit circle
- (b) Plot a plus sign "+" inside the unit circle, for which the horizontal line and vertical line both touches the circle.