# Lab 7

Ch En 263 – Numerical Tools

Due: 1 Feb. 2024

## Instructions

- Complete the exercise(s) below, and submit the following files to Learning Suite:

  - Handwritten portion: scan each page (or take a picture) and combine them into a single pdf named: `LastName_FirstName_Lab7.pdf`
  - Excel portion: submit a workbook named `LastName_FirstName_Lab7.xlsx` where each worksheet tab is named "Problem_1", "Problem_2", etc.
  - Python portion: submit a separate file for each problem named `LastName_FirstName_Lab7_ProblemXX.py` where XX is the problem number.

- Warning: the LS assignment will close promptly at 11:59 pm and late assignments will only receive 50% credit.

## Lab Exercises

1. Do the following in a Python file.

   (a) Define a Python list called `my_list`, a Python tuple `my_tuple` and a Numpy array `my_array` with the values $x = [4, 7, -2, 5, 13]$.

   (b) Find the length of the list, and print it to the console.

   (c) Print the value of the $3^{\text{rd}}$ element of the tuple to the console.

   (d) Print the value of the last element of the array to the console.
   *Hint: Remember that indices start counting at zero.*

2. Do the following in a Python file.

   (a) Use a loop to fill an array with the sequence: 1, 4, 9, ..., 144. Print the array to the console.

   (b) Use a loop to find the average of the values in the array and print the value to the console.

   (c) Find the average of the values in the array using a function in the numpy module and print the value to the console. A list of the functions in the numpy module can be found here: https://docs.scipy.org/doc/numpy-1.13.0/reference/routines.html

3. Do the following in a Python file.

   (a) Create a numpy array with the values in the matrix below.

$$\begin{bmatrix} 1 & -5 & 6 & -1 & 0 \\ 5 & 2 & 0 & 4 & -2 \\ -7 & -7 & 1 & -8 & 4 \\ -5 & 7 & 2 & -9 & 5 \\ 5 & 3 & 0 & 2 & 1 \\ 0 & 6 & 4 & 0 & 2 \end{bmatrix}$$

(b) Use the `numpy.shape` function to print the shape of the array to the console.

(c) Print the following values to the console: ($3^{\text{rd}}$ row, $4^{\text{th}}$ column), ($6^{\text{th}}$ row, $1^{\text{st}}$ column), ($5^{\text{th}}$ row, $2^{\text{nd}}$ column)

(d) Extract a $2 \times 2$ matrix that spans the $4^{\text{th}}$-$5^{\text{th}}$ rows and $1^{\text{st}}$-$2^{\text{nd}}$ columns. Print it to the console.