

# Practice Exam 2 – Numerical Computing

Ch En 263 – Numerical Tools

## Instructions

- You have 50 minutes to complete the exam.
- You **may** two pages (front and back) of notes
- You **may not** look at another person's exam or ask them for help, but you may of course ask clarifying questions to Dr. Tree or the TAs.
- You need a computer to complete this exam. You may not use a calculator.
- You may use scratch paper, but it will not be accepted for credit.
- Certain questions require that you submit an Excel workbook (\*.xlsx) and/or a Python (\*.py) file.
- **Save often!**
- **Make sure that you turn in the correct files!**

## Exam Contents

This exam contains:

- 8 Qualitative Questions (32 pts)
- 4 Quantitative Questions (64 pts)
- Turn in your files (4 pts)

## I. Qualitative Questions (32 pts)

Enter your answer into the “Multiple\_Choice” worksheet in the Excel workbook named “Last-name\_Firstname\_Exam1.xlsx.”

1. What is the main purpose of a `for` loop in Python?

- (a) To repeat a block of code for each element in a sequence.
- (b) To check whether a condition is true or false.
- (c) To group several lines of code together as a reusable unit
- (d) To import functions from another module.

2. The following code snippet defines what type of object?

```
unknown_variable = (4, 5, 8, 10)
```

- (a) A list
- (b) A tuple
- (c) A Numpy array
- (d) A range

3. Suppose `data` is a 2D Numpy array, whose first column is the x-value and whose second column is the y-value that I want to plot. How do I get the two columns out?

- (a) `x = data[:, 0]; y = data[:, 1]`
- (b) `x = data[1, :]; y = data[1, :]`
- (c) `x, y = data`
- (d) `x = data[0]; y = data[1]`

4. What will print if the Python code below is executed?

```
i=0
while (i<5):
    i=1
    print(i)
```

- (a) 0 1 2 3 4
- (b) 1 2 3 4 5
- (c) 0 1 2 3 4 5
- (d) 1 1 1 1 ... (forever)

5. Suppose you want to load a csv file in Python. What command would you use?

- (a) `np.open("filename.csv")`
- (b) `np.read_csv("filename.csv")`
- (c) `np.loadtxt("filename.csv", delimiter=",")`
- (d) `np.loadtxt("filename.csv", delimiter=" ")`

6. Find the bug in the snippet of code. What type of bug is it?

```
def set_a():
    a=5
    return a

set_a()
print(a)
```

- (a) `a` is a local variable. This is an execution error.
- (b) The colon after `set_a()` is incorrect. This is a syntax error.
- (c) The code runs, but gives the wrong result. This is a logic error.
- (d) The value returned by `set_a()` was not stored. This is a logic error.

7. What is the result of the execution of the Python code below?

```
x = np.array([0, 2, 4, 6, 8, 10])
y = x[2:5]
print(y)
```

- (a) 2, 4, 6
- (b) 2, 4, 6, 8
- (c) 4, 6, 8
- (d) 4, 6, 8, 10

8. What numbers will be printed by the following code?

```
for i in range(2, 10, 3):
    print(i)
```

- (a) 3, 6, 9
- (b) 2, 5, 7, 10
- (c) 2, 5, 8
- (d) 2, 5, 8, 11

## II. Quantitative Questions (64 pts)

*You must show your work for these problems in order to get full credit.* For problems 9 and 10 use an Excel Workbook named “Lastname.Firstname.Exam2.xlsx”. For problems 11 and 12 use a Python file named “Lastname.Firstname.Exam2.py”.

9. Use Excel to find the quantity

$$\frac{1}{50} \sum_{n=1}^{50} \cos\left(\frac{3\pi}{4n}\right)$$

10. The file `Birthdays.csv` contains a list of the birth month (1st column), day (2nd column) and year (3rd column) for several different people. The first line of the file is a header. Use Excel to read this file and determine how many birthdays in the list occur in the months of March, April, or May.

11. Use Python to find the sum of all of the odd numbers between 0 and 100

12. Use Python to plot the function

$$y = (x^2 + 3x - 7) \sin(3x)$$

on the domain  $x \in [0, 5]$ . Label the x- and y-axis with `x` and `y` in 12 pt font.