Final review

EML4930/6934, Python Programming, Fall 2017

Name:

Instructions: Please answer the questions below. You are not allowed to use any notes or calculator on this Exam. You are not allowed to work with your neighbor.

1. Name one difference between Python 2 and Python 3.
2. Show a properly syntax single line comment in Python. Show a bulk/multi-line comment in Python.
3. Consider floor division in Python 3. What will 3//2 return?
4. Consider a list named x. What is the easiest way to call the last item in list x?
5. How should you properly denote a code block in Python?
6. Consider the following code:

```
for i in range(100):
    print(i)
```

   What will be the first value of i? What will be the last value of i?

7. Consider the following code:

```
x = [1, 2, 3, 4, 5]
y = [i**2 for i in x]
```

   List the values in y.

8. Define a function solve the quadratic equation

$$ax^2 + bx + c = 0 \tag{1}$$

   where a, b, c are known numbers that are the input to your function. The solution is obtained as

$$x_1 = \frac{-b + \sqrt{b^2 - 4ac}}{2a}, x_2 = \frac{-b + \sqrt{b^2 - 4ac}}{2a} \tag{2}$$

   and your function should return x_1 and x_2.

9. What is the output of the following code

```
x = 1
def new_x():
    x = 2
    print(x)
new_x()
print(x)
```

10. What is the name of the function within a class that runs automatically on each new instance of an object?

11. Consider an object named a. What is one way to list all of the attributes (and methods) within the object a?

12. How would you take the square root of 63.1516 in Python? (if you use a library you must stat the correct import)

13. Consider a list name x that already contains a lot of information. Consider a list y = ['bob', 'loves Python', 87289]. How would you add y to the end of list x?

14. z is a high dimensional numpy array. How would you find the index location of the maximum value of z?

15. Code a:

```
import numpy as np
x = np.random.random(100000)
y = []
for i in x:
    y.append(2.0*x)
y = np.array(y)
```

Code b:

```
import numpy as np
x = np.random.random(100000)
y = 2.0*x
```

Code a and code b do the exact same thing. Which code will run faster? (a, b, or both will run the same speed) Why?

16. Your friend is new to Python and programming. He is running the following code:

```
from __future__ import division
import numpy as np
x = np.ones(10, dtype='int')
y = np.random.random(10)
for i in range(10):
    x[i] = y[i]/2.0
```

but he keeps getting that x = array([0, 0, 0, 0, 0, 0, 0, 0, 0, 0]). Why is each item in x zero?

17. given x = np.array([[4.0, 2.0],[-2.0,3.0]])

How would you transpose x?

18. Write out the values in z

```
x = np.array([[4.0, 2.0],
              [-2.0,3.0]])
y = np.array([[2.0, 1.0],
              [0.0, 1.0])
z = x*y
```

19. Consider the following matrix multiplication

$$\begin{bmatrix} 2 & 3 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} 5 & 2 \\ 1 & 3 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ 2 & 0 \end{bmatrix} = z \tag{3}$$

    Write out all the code (including imports) to solve for z in Python.

20. Plot the function

$$y(x) = x^3 + 2x + 10.0 \tag{4}$$

    on the domain

$$10 \leq x \leq 19 \tag{5}$$

    using Python. Include all necessary imported libraries.

21. Define a function that will return A, B. A and B are variables passed to the function. If B is not specified, it will default to a value of 1.0.

22. Open readme.txt using Python and print the contents.

23. What is the difference between

```
f = open(myFile)
```

    and

```
with open(myFile) as f:
```

24. Why Does the following code produce x = array([0, 0, 1]) in Python?

```
x = np.array((0,0,0))
for i in range(3):
    x[i] = i/2.0
```

    Fix this code such that x = array([0.0, 0.5, 1.0]) after the for loop.

25. Correct this code

```
for i in range(10):
    if i > 5
        break
```

    such that it no longer produces this SyntaxError

```
    if i > 5
            ^
SyntaxError: invalid syntax
```

26. Why would you use numpy.random.seed() when generating random numbers?

27. Your friend wanted to grab the First item in the numpy array x. Consider his code:

```
x = np.random.random(100)
y = x(1)
```

produces the Following syntax error

```
      1 x = np.random.random(100)
      2 x = np.random.random(100)
----> 3 y = x(1)

TypeError: 'numpy.ndarray' object is not callable
```

What two things is your friend missing?

28. What does the function *os.system* do? Name a potential example where *os.system* could be useful in a Python program?

29. What is the Difference between Built-In Python libraries like os and math and libraries like numpy, pandas, and matplotlib?

30. Consider

```
a = [0.0, 1.0, ['hi', 'world'], 2.0, 'blue']
```

what will

```
print(len(a))
```

return?