

ECE-203 Programming for Engineers

Laboratory Experiment 2

Name: _____

Part 1 – In Lab Assignments (Due end of this lab session)

(10 Points) Let p be a bank's interest rate in percent per year (APR). An initial amount of money M will mature to the amount of

$$M \left(1 + \frac{p}{100}\right)^n$$

after n years have passed. Write a Python program that computes how much \$1,000 will have matured to after 5 years with an interest rate of 0.95% APR¹.

TA Initials _____

(10 Points) Type up and run this short program intended to evaluate the expression

$$y = \sin^2(x) + \cos^2(x)$$

```
from math import sin, cos, pi
x = pi/4
1_val = sin^2(x) + cos^2(x)
print 1_VAL
```

Fix this program by identifying and correcting erroneous statements, syntax errors, etc.

TA Initials _____

(10 Points) The following code attempts to solve the constant acceleration example we discussed in the second lecture

```
v0 = 3 m/s
t = 1 s
a = 2 m/s**2
d = v0*t + 1/2 a*t**2
print d
```

Again, fix this program by identifying and correcting erroneous statements, syntax errors, etc.

TA Initials _____

¹Look online – is this a good interest rate for a savings account in the current market?

(10 Points) The following code attempts to verify the equations

$$(a + b)^2 = a^2 + 2ab + b^2$$

$$(a - b)^2 = a^2 - 2ab + b^2$$

```
a = 3,3      b = 5,3
a2 = a**2
b2 = b**2

eq1_sum = a2 + 2ab + b2
eq2_sum = a2 - 2ab + b2

eq1_pow = (a + b)**2
eq2pow = (a - b)**2

print '1st equation: %g = %g', % (eq1_sum, eq1_pow)
print '2nd equation: %h = %h', % (eq2_pow, eq2_pow)
```

Again, fix this program by identifying and correcting erroneous statements, syntax errors, etc.

TA Initials _____

(10 Points) Given the quadratic equation

$$ax^2 + bx + c = 0$$

the two roots are

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

Identify the problem with the following program.

```
import math

a = 7
b = 26
c = 3

q = math.sqrt(b*b - 4*a*c)

x1 = (-b + q)/2a
x2 = (-b - q)/2a

print """
x1 = %g
x2 = %g
""" % (x1, x2)
```

TA Initials _____

Part 2 – Out of Lab Assignments (Due Friday, Jan 22nd – Online)

(20 Points) The formula for converting from degrees Fahrenheit to degrees Celsius is

$$C = \frac{5}{9}(F - 32)$$

Write a program that prints out a conversion table with degrees Fahrenheit in the first column and degrees Celsius in the second column. The table should start at 0°F and end at 100°F with 10° increments. When displayed, decimals should be carried out to two places. Name this file **ftoc1.py** and save its output as **ftoc1.txt**.

Please watch the tutorial **HOWTO: Saving Output** if you need help capturing your program's output in a text file.

Please watch the tutorial **HOWTO: Transferring Files via SFTP** if you need help transferring your program file (**ftoc1.py**) and its output (**ftoc1.txt**) to your local computer for upload to BBLearn.

(10 Points) The conversion from Fahrenheit to Celsius is often approximated as

$$C \approx \hat{C} = \frac{1}{2}(F - 30)$$

when people perform the conversion mentally or conversationally. Create a new program based on **ftoc1.py** that adds a third column containing this approximation as well as a fourth column containing the error of the approximation (as $\hat{C} - C$). When displayed, decimals should be carried out to two places. Name this file **ftoc2.py** and save its output as **ftoc2.txt**

(20 Points) Write a Python program to compute the following expression:

$$s = \sum_{k=1}^M \frac{1}{k}$$

Write your program so that the limit of summation M is defined at run time by taking user input from the keyboard. When writing your program, you may assume that the user will type in only valid input. Name this file **summation.py** and save its output as **summation.txt**