Homework 2

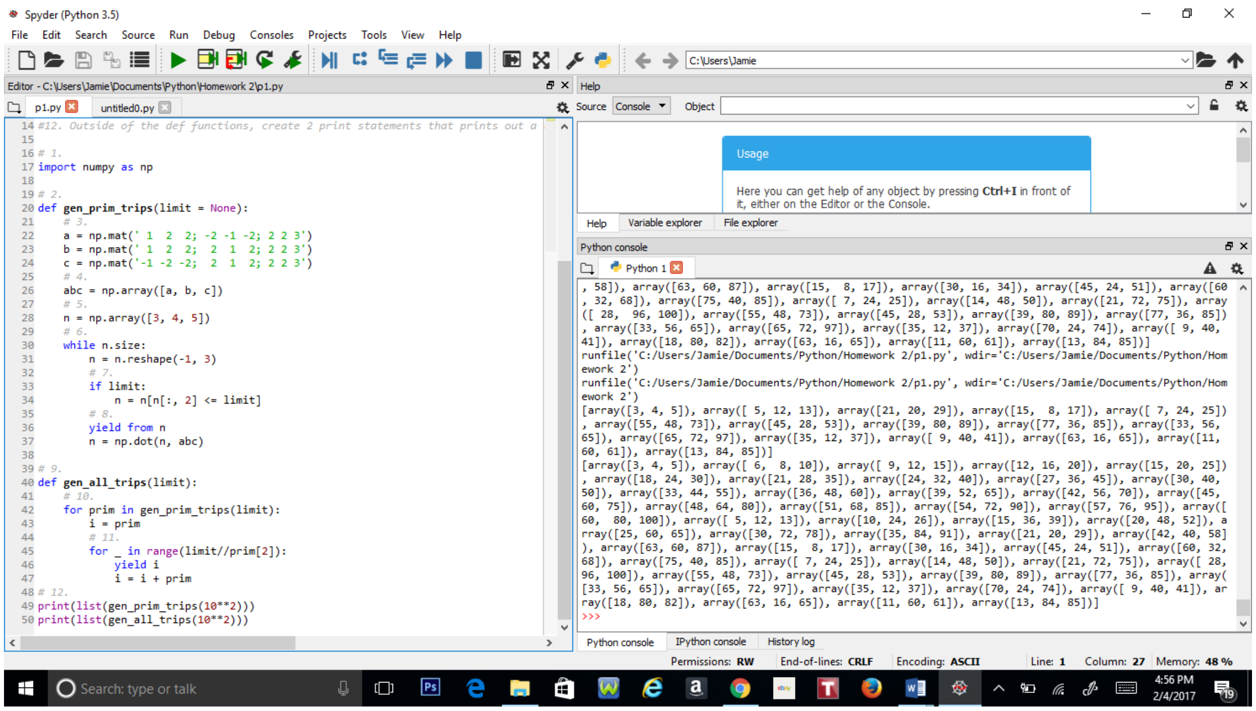
Jamie Andrews

Problem 1:

a.
```
public Group <Triple> by AWhileLoop () {
    Group <Triple> result = new ArrayList <Triple> (limit);
    for (int a = 1; a < limit; ++a) {
        int aa = a * a;
        int b = a + 1;
        int c = b + 1;
        while (c <= limit) {
            int cc = aa + b * b;
            while (c * c < cc) {++c;}
            if (c * c == cc && c <= limit) {
                result.add (new Triple (a, b, c));
            }
            ++b;
        }
    }
    return result;
}
```

b.
```
#--------Homework 2 Question 1 by Jamie Andrews --------

#1. Make sure to import numpy as np before typing any code.
#2. Define a def funtion that generates Pythagorean triples, but only gives out the primitive triples.
#3. Define 3 functions np.mat function to set up the Pythagorean numbers.
#4. Call an array function and set array with the 3 np.mat functions.
#5. Call another array function and set array with integers 3, 4, and 5.
#6. Create a while loop in the def function that generates the numbers used in the Pythagorean Theorem.
#7. Create an if statement in the while loop when if is the limit.
#8. Create a yield statement in the while loop function derived from n.
#9. Create a second def function that generates all Pythagorean triples.
#10. Create a for loop in the def function that takes all the primitive triples from the first def function
#11. Create another for loop in the for loop using in range and it should add all the other triples aside from the primitives.
#12. Outside of the def functions, create 2 print statements that prints out a list of the 2 def functions using an exponent value by the 10th power.

# 1.
```

```
import numpy as np

# 2.
def gen_prim_trips(limit = None):
    # 3.
    a = np.mat(' 1  2  2; -2 -1 -2; 2 2 3')
    b = np.mat(' 1  2  2;  2  1  2; 2 2 3')
    c = np.mat('-1 -2 -2;  2  1  2; 2 2 3')
    # 4.
    abc = np.array([a, b, c])
    # 5.
    n = np.array([3, 4, 5])
    # 6.
    while n.size:
        n = n.reshape(-1, 3)
        # 7.
        if limit:
            n = n[n[:, 2] <= limit]
        # 8.
        yield from n
        n = np.dot(n, abc)

# 9.
def gen_all_trips(limit):
    # 10.
    for prim in gen_prim_trips(limit):
        i = prim
        # 11.
        for _ in range(limit//prim[2]):
            yield i
            i = i + prim
# 12.
print(list(gen_prim_trips(10**2)))
print(list(gen_all_trips(10**2)))
```



```python
#12. Outside of the def functions, create 2 print statements that prints out a

# 1.
import numpy as np

# 2.
def gen_prim_trips(limit = None):
    # 3.
    a = np.mat(' 1  2  2; -2 -1 -2; 2 2 3')
    b = np.mat(' 1  2  2;  2  1  2; 2 2 3')
    c = np.mat('-1 -2 -2;  2  1  2; 2 2 3')
    # 4.
    abc = np.array([a, b, c])
    # 5.
    n = np.array([3, 4, 5])
    # 6.
    while n.size:
        n = n.reshape(-1, 3)
        # 7.
        if limit:
            n = n[n[:, 2] <= limit]
        # 8.
        yield from n
        n = np.dot(n, abc)

# 9.
def gen_all_trips(limit):
    # 10.
    for prim in gen_prim_trips(limit):
        i = prim
        # 11.
        for _ in range(limit//prim[2]):
            yield i
            i = i + prim
# 12.
print(list(gen_prim_trips(10**2)))
print(list(gen_all_trips(10**2)))
```

```
, 58]), array([63, 60, 87]), array([15,  8, 17]), array([30, 16, 34]), array([45, 24, 51]), array([60
, 32, 68]), array([75, 40, 85]), array([ 7, 24, 25]), array([14, 48, 50]), array([21, 72, 75]), array
([ 28,  96, 100]), array([55, 48, 73]), array([45, 28, 53]), array([39, 80, 89]), array([77, 36, 85])
, array([33, 56, 65]), array([65, 72, 97]), array([35, 12, 37]), array([70, 24, 74]), array([ 9, 40,
41]), array([18, 80, 82]), array([63, 16, 65]), array([11, 60, 61]), array([13, 84, 85])]
runfile('C:/Users/Jamie/Documents/Python/Homework 2/p1.py', wdir='C:/Users/Jamie/Documents/Python/Hom
ework 2')
runfile('C:/Users/Jamie/Documents/Python/Homework 2/p1.py', wdir='C:/Users/Jamie/Documents/Python/Hom
ework 2')
[array([3, 4, 5]), array([ 5, 12, 13]), array([21, 20, 29]), array([15,  8, 17]), array([ 7, 24, 25])
, array([55, 48, 73]), array([45, 28, 53]), array([39, 80, 89]), array([77, 36, 85]), array([33, 56,
65]), array([65, 72, 97]), array([35, 12, 37]), array([ 9, 40, 41]), array([63, 16, 65]), array([11,
60, 61]), array([13, 84, 85])]
[array([3, 4, 5]), array([ 6,  8, 10]), array([ 9, 12, 15]), array([12, 16, 20]), array([15, 20, 25])
, array([18, 24, 30]), array([21, 28, 35]), array([24, 32, 40]), array([27, 36, 45]), array([30, 40,
50]), array([33, 44, 55]), array([36, 48, 60]), array([39, 52, 65]), array([42, 56, 70]), array([45,
60, 75]), array([48, 64, 80]), array([51, 68, 85]), array([54, 72, 90]), array([57, 76, 95]), array([
60,  80, 100]), array([ 5, 12, 13]), array([10, 24, 26]), array([15, 36, 39]), array([20, 48, 52]), a
rray([25, 60, 65]), array([30, 72, 78]), array([35, 84, 91]), array([21, 20, 29]), array([42, 40, 58]
), array([63, 60, 87]), array([15,  8, 17]), array([30, 16, 34]), array([45, 24, 51]), array([60, 32,
68]), array([75, 40, 85]), array([ 7, 24, 25]), array([14, 48, 50]), array([21, 72, 75]), array([ 28,
96, 100]), array([55, 48, 73]), array([45, 28, 53]), array([39, 80, 89]), array([77, 36, 85]), array(
[33, 56, 65]), array([65, 72, 97]), array([35, 12, 37]), array([70, 24, 74]), array([ 9, 40, 41]), ar
ray([18, 80, 82]), array([63, 16, 65]), array([11, 60, 61]), array([13, 84, 85])]
>>>
```

Spyder (Python 3.5)
File Edit Search Source Run Debug Consoles Projects Tools View Help
C:\Users\Jamie
Editor - C:\Users\Jamie\Documents\Python\Homework 2\p1.py
p1.py
untitled0.py
Help
Source Console Object
Usage
Here you can get help of any object by pressing Ctrl+I in front of it, either on the Editor or the Console.
Help Variable explorer File explorer
Python console
Python 1
Python console IPython console History log
Permissions: RW End-of-lines: CRLF Encoding: ASCII Line: 1 Column: 27 Memory: 48 %
Search: type or talk
4:56 PM
2/4/2017

<u>Problem 2:</u>

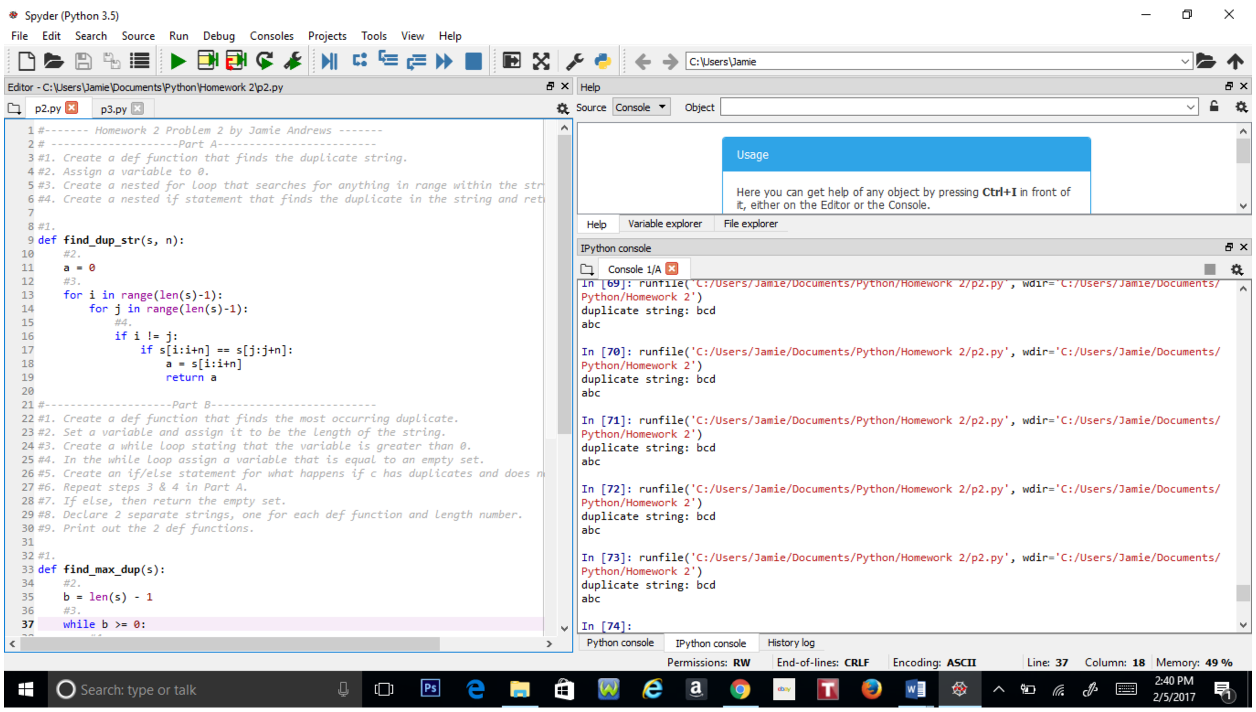
```
i.    Public Group<Duplicate> by AWhileLoop(s, n){
              a = 0;
              length = length(s);
              for(int = i; i < length; ++i){
                  for(int = j; j < length; ++j){
                      if i != j {
                          if s(i, i + n) == s(j, j + n){
                              a = s(i, i + n);
                              return a;
                      }
                  }
              }
          }
      }
ii.   Public Group<Max_Duplicate> by AWhileLoop(s){
              b = length(s) – 1;
              while (b >=0){
                      c = string’ ’;
                      if c != 0{
                          for(int = i; i < length; ++i){
                              for(int = j; j < length; ++j){
                                  if i != j {
                                      if s(i, i + n) == s(j, j + n){
                                        a = s(i, i + n);
                                        return a;

                                       }
                                     }

                                  }

                              }
                          }
                          else{
                               b =  b – 1;
                               return c;
                          }
                      }
               }
```

iii.

```
#------- Homework 2 Problem 2 by Jamie Andrews -------
# --------------------Part A------------------------
#1. Create a def function that finds the duplicate string.
#2. Assign a variable to 0.
#3. Create a nested for loop that searches for anything in range within the string.
#4. Create a nested if statement that finds the duplicate in the string and returns the
duplicate.

#1.
def find_dup_str(s, n):
    #2.
    a = 0
    #3.
    for i in range(len(s)-1):
        for j in range(len(s)-1):
            #4.
            if i != j:
                if s[i:i+n] == s[j:j+n]:
                    a = s[i:i+n]
                    return a

#--------------------Part B-------------------------
#1. Create a def function that finds the most occurring duplicate.
#2. Set a variable and assign it to be the length of the string.
#3. Create a while loop stating that the variable is greater than 0.
```

#4. In the while loop assign a variable that is equal to an empty set.
#5. Create an if/else statement for what happens if c has duplicates and does not equal to 0.
#6. Repeat steps 3 & 4 in Part A.
#7. If else, then return the empty set.
#8. Declare 2 separate strings, one for each def function and length number.
#9. Print out the 2 def functions.

```
#1.
def find_max_dup(s):
    #2.
    b = len(s) - 1
    #3.
    while b >= 0:
        #4.
        c = set()
        #5.
        if c != 0:
            #6.
            for i in range(len(s)-1):
                for j in range(len(s)-1):
                    if i != j:
                        if s[i:i+n] == s[j:j+n]:
                            a = s[i:i+n]
                            return a
        #7.
        else:
            b = b - 1
            return c
#8.
s = 'abcdefbcdgh'
d = 'abcdefgheabcd'
n = 3

#9.
print("duplicate string:", find_dup_str(s,n))
print(find_max_dup(d))
```



Editor - C:\Users\Jamie\Documents\Python\Homework 2\p2.py

```python
#------- Homework 2 Problem 2 by Jamie Andrews -------
# -------------------Part A------------------------
#1. Create a def function that finds the duplicate string.
#2. Assign a variable to 0.
#3. Create a nested for loop that searches for anything in range within the str
#4. Create a nested if statement that finds the duplicate in the string and ret

#1.
def find_dup_str(s, n):
    #2.
    a = 0
    #3.
    for i in range(len(s)-1):
        for j in range(len(s)-1):
            #4.
            if i != j:
                if s[i:i+n] == s[j:j+n]:
                    a = s[i:i+n]
                    return a

#-------------------Part B-------------------------
#1. Create a def function that finds the most occurring duplicate.
#2. Set a variable and assign it to be the length of the string.
#3. Create a while loop stating that the variable is greater than 0.
#4. In the while loop assign a variable that is equal to an empty set.
#5. Create an if/else statement for what happens if c has duplicates and does n
#6. Repeat steps 3 & 4 in Part A.
#7. If else, then return the empty set.
#8. Declare 2 separate strings, one for each def function and length number.
#9. Print out the 2 def functions.

#1.
def find_max_dup(s):
    #2.
    b = len(s) - 1
    #3.
    while b >= 0:
```

IPython console

```
In [69]: runfile('C:/Users/Jamie/Documents/Python/Homework 2/p2.py', wdir='C:/Users/Jamie/Documents/
Python/Homework 2')
duplicate string: bcd
abc

In [70]: runfile('C:/Users/Jamie/Documents/Python/Homework 2/p2.py', wdir='C:/Users/Jamie/Documents/
Python/Homework 2')
duplicate string: bcd
abc

In [71]: runfile('C:/Users/Jamie/Documents/Python/Homework 2/p2.py', wdir='C:/Users/Jamie/Documents/
Python/Homework 2')
duplicate string: bcd
abc

In [72]: runfile('C:/Users/Jamie/Documents/Python/Homework 2/p2.py', wdir='C:/Users/Jamie/Documents/
Python/Homework 2')
duplicate string: bcd
abc

In [73]: runfile('C:/Users/Jamie/Documents/Python/Homework 2/p2.py', wdir='C:/Users/Jamie/Documents/
Python/Homework 2')
duplicate string: bcd
abc

In [74]:
```

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Spyder (Python 3.5)
File Edit Search Source Run Debug Consoles Projects Tools View Help
C:\Users\Jamie
p2.py
p3.py
Help
Source Console Object
Usage
Here you can get help of any object by pressing Ctrl+I in front of it, either on the Editor or the Console.
Help Variable explorer File explorer
Console 1/A
Python console IPython console History log
Search: type or talk
2:40 PM
2/5/2017

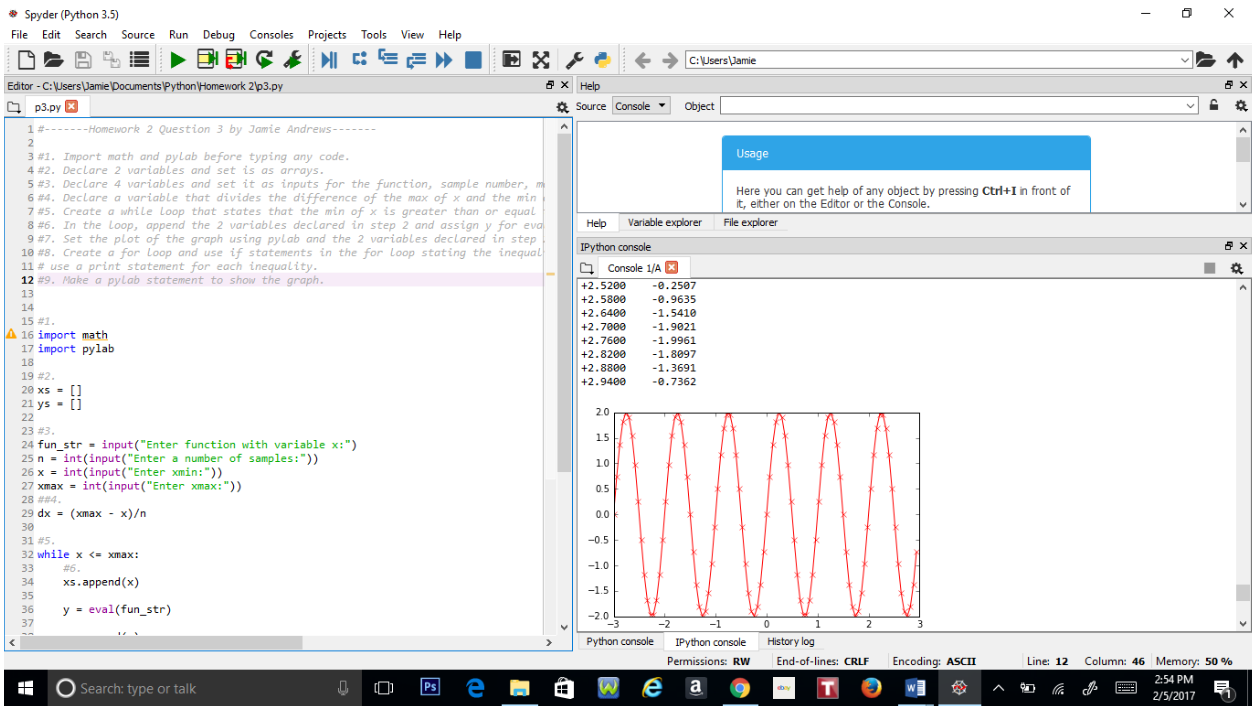
Problem 3:

#-------Homework 2 Question 3 by Jamie Andrews-------

#1. Import math and pylab before typing any code.
#2. Declare 2 variables and set is as arrays.
#3. Declare 4 variables and set it as inputs for the function, sample number, max and min of x.
#4. Declare a variable that divides the difference of the max of x and the min of x divided by the sample number.
#5. Create a while loop that states that the min of x is greater than or equal to the max of x.
#6. In the loop, append the 2 variables declared in step 2 and assign y for evaluation, then increment the min of x with the variable from step 4.
#7. Set the plot of the graph using pylab and the 2 variables declared in step 2.
#8. Create a for loop and use if statements in the for loop stating the inequalities of xs and ys using 0 as a comparison and
# use a print statement for each inequality.
#9. Make a pylab statement to show the graph.

```python
#1.
import math
import pylab
```

```
#2.
xs = []
ys = []

#3.
fun_str = input("Enter function with variable x:")
n = int(input("Enter a number of samples:"))
x = int(input("Enter xmin:"))
xmax = int(input("Enter xmax:"))
#4.
dx = (xmax - x)/n

#5.
while x <= xmax:
    #6.
    xs.append(x)

    y = eval(fun_str)

    ys.append(y)

    x += dx
#7.
pylab.plot(xs, ys, "rx-")

#8.
for i in range(n):
    if xs[i] >= 0 and ys[i] >= 0:
        print('+{:.4f}{:4s}{:.4f}'.format(xs[i],'  ',ys[i]))
    elif xs[i] >= 0 and ys[i] <= 0:
        print('+{:.4f}{:4s}{:.4f}'.format(xs[i],'  ',ys[i]))
    elif xs[i] <= 0 and ys[i] <= 0:
        print('+{:.4f}{:4s}{:.4f}'.format(xs[i],'  ',ys[i]))
#9.
pylab.show()
```



Spyder (Python 3.5)

Editor - C:\Users\Jamie\Documents\Python\Homework 2\p3.py

```
#-------Homework 2 Question 3 by Jamie Andrews-------

#1. Import math and pylab before typing any code.
#2. Declare 2 variables and set is as arrays.
#3. Declare 4 variables and set it as inputs for the function, sample number, m
#4. Declare a variable that divides the difference of the max of x and the min
#5. Create a while loop that states that the min of x is greater than or equal
#6. In the loop, append the 2 variables declared in step 2 and assign y for eva
#7. Set the plot of the graph using pylab and the 2 variables declared in step
#8. Create a for loop and use if statements in the for loop stating the inequal
# use a print statement for each inequality.
#9. Make a pylab statement to show the graph.


#1.
import math
import pylab

#2.
xs = []
ys = []

#3.
fun_str = input("Enter function with variable x:")
n = int(input("Enter a number of samples:"))
x = int(input("Enter xmin:"))
xmax = int(input("Enter xmax:"))
##4.
dx = (xmax - x)/n

#5.
while x <= xmax:
    #6.
    xs.append(x)

    y = eval(fun_str)

```

IPython console — Console 1/A

```
+2.5200    -0.2507
+2.5800    -0.9635
+2.6400    -1.5410
+2.7000    -1.9021
+2.7600    -1.9961
+2.8200    -1.8097
+2.8800    -1.3691
+2.9400    -0.7362
```

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