

第一題：

程式碼：

```
from numpy import sqrt
a,b,c=int(input()),int(input()),int(input())
if (b*b-4*a*c)<0:
    print((-b/2*a),end="")
    print("±",end="")
    print((sqrt(-(b*b-4*a*c)))/2*a,end="")
    print("i")
else:
    print((-b+sqrt(b*b-4*a*c))/2*a)
    print(" and ")
    print(-(-b-sqrt(b*b-4*a*c))/2*a)
```

結果：

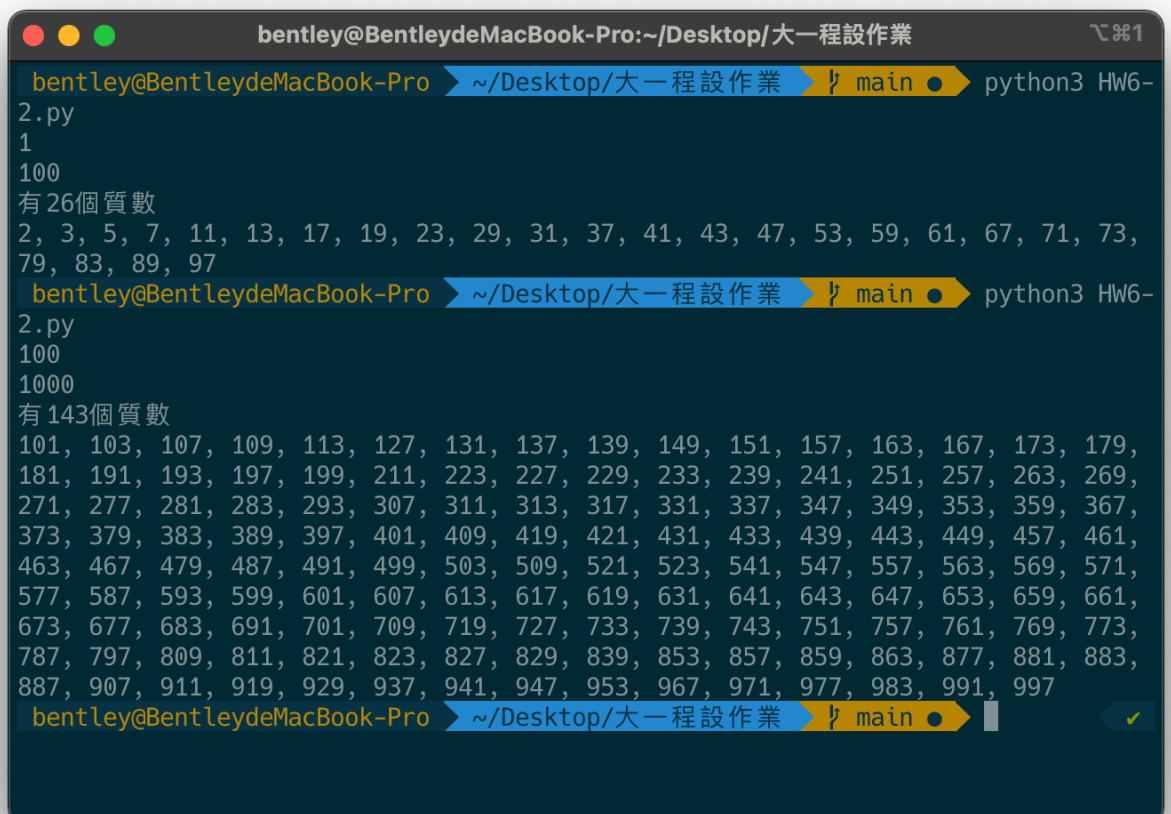
```
bentley@BentleydeMacBook-Pro:~/Desktop/大一程設作業
bentley@BentleydeMacBook-Pro > ~/Desktop/大一程設作業 > main > python3 HW6-1.py
1
1
2
1
-1.0
and
1.0
bentley@BentleydeMacBook-Pro > ~/Desktop/大一程設作業 > main > python3 HW6-1.py
1
1
4
4
-2.0
and
2.0
bentley@BentleydeMacBook-Pro > ~/Desktop/大一程設作業 > main > python3 HW6-1.py
1
1
0
1
0.0±1.0i
bentley@BentleydeMacBook-Pro > ~/Desktop/大一程設作業 > main >
```

第二題：

程式碼：

```
a,b=int(input()),int(input())
bol=1
counter=0
s=""
for i in range(a,b):
    bol=1
    if i==1:continue
    if i==2:
        counter+=1
    for j in range(2,i-1):
        if i%j==0:
            bol=0
            break
    if bol==1:
        counter+=1
        s+=str(i)+", "
s = s[:-2]
print("有"+str(counter)+"個質數\n"+s)
```

結果：



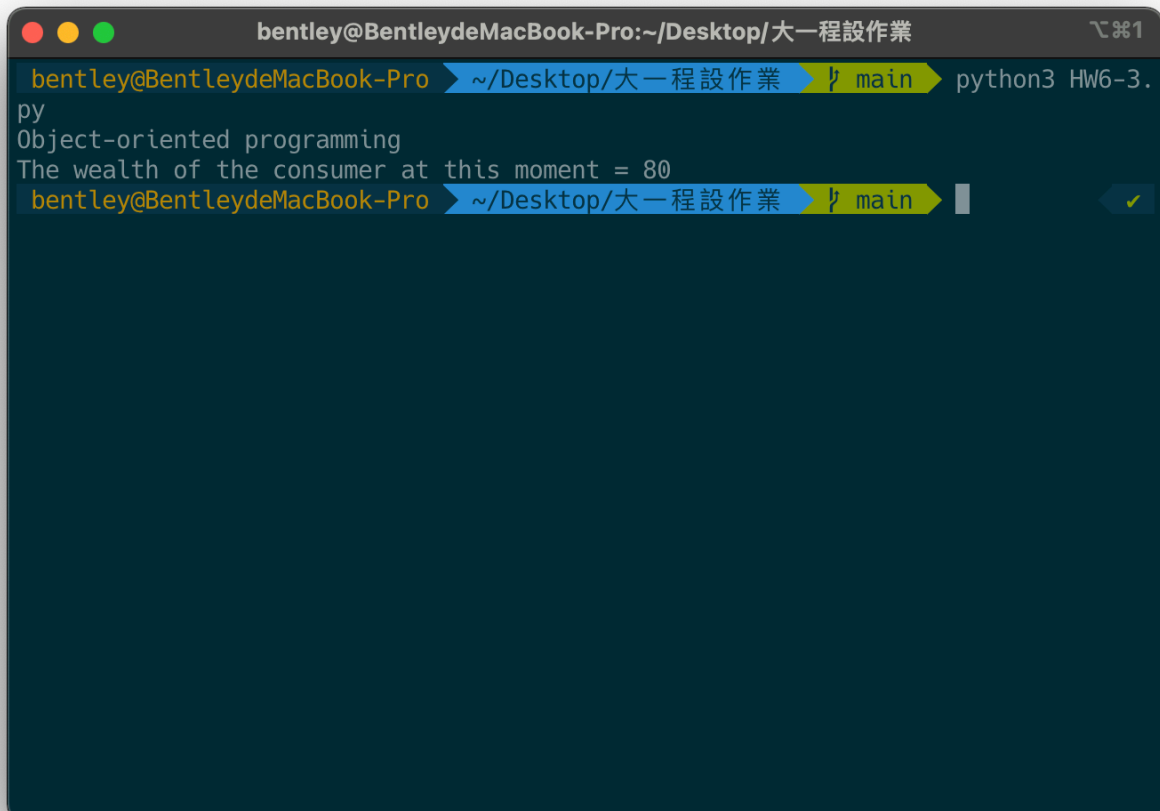
```
bentley@BentleydeMacBook-Pro:~/Desktop/大一程設作業
bentley@BentleydeMacBook-Pro ~/Desktop/大一程設作業 1 main python3 HW6-2.py
1
100
有26個質數
2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97
bentley@BentleydeMacBook-Pro ~/Desktop/大一程設作業 1 main python3 HW6-2.py
100
1000
有143個質數
101, 103, 107, 109, 113, 127, 131, 137, 139, 149, 151, 157, 163, 167, 173, 179, 181, 191, 193, 197, 199, 211, 223, 227, 229, 233, 239, 241, 251, 257, 263, 269, 271, 277, 281, 283, 293, 307, 311, 313, 317, 331, 337, 347, 349, 353, 359, 367, 373, 379, 383, 389, 397, 401, 409, 419, 421, 431, 433, 439, 443, 449, 457, 461, 463, 467, 479, 487, 491, 499, 503, 509, 521, 523, 541, 547, 557, 563, 569, 571, 577, 587, 593, 599, 601, 607, 613, 617, 619, 631, 641, 643, 647, 653, 659, 661, 673, 677, 683, 691, 701, 709, 719, 727, 733, 739, 743, 751, 757, 761, 769, 773, 787, 797, 809, 811, 821, 823, 827, 829, 839, 853, 857, 859, 863, 877, 881, 883, 887, 907, 911, 919, 929, 937, 941, 947, 953, 967, 971, 977, 983, 991, 997
bentley@BentleydeMacBook-Pro ~/Desktop/大一程設作業 1 main
```

第三題：

程式碼：

```
class Consumer:
    def __init__(self, w):
        self.wealth = w
    def earn(self, y):
        self.wealth = self.wealth + y
    def spend(self, x):
        new_wealth=self.wealth-x
        if new_wealth < 0:
            print("Insufficient funds")
        else:
            self.wealth = new_wealth
c1 = Consumer(100)
c1.earn(10)
c1.spend(20)
c1.earn(10)
c1.spend(20)
print("Object-oriented programming")
print("The wealth of the consumer at this moment
=",c1.wealth)
```

結果：



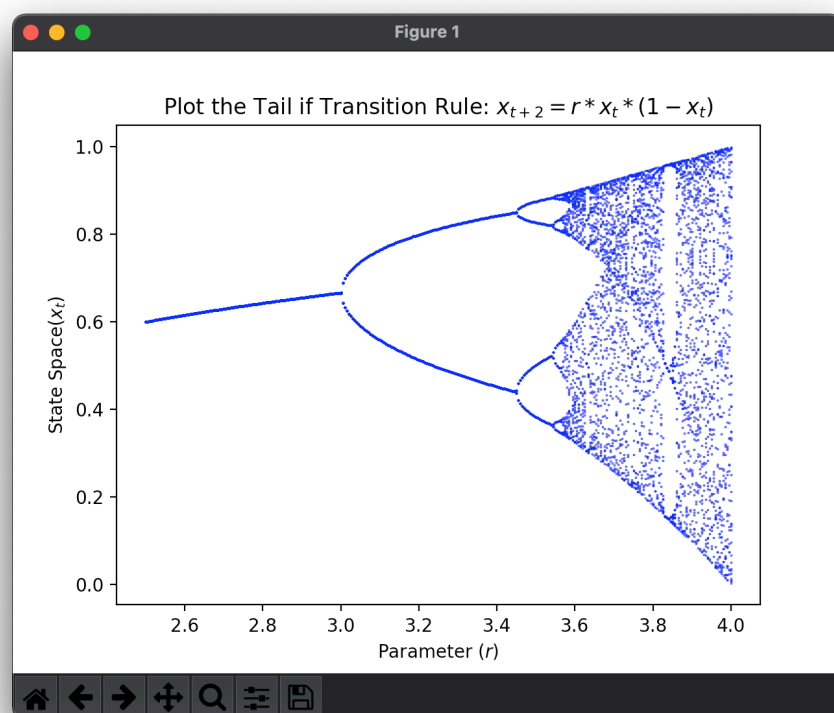
```
bentley@BentleydeMacBook-Pro:~/Desktop/大一程設作業
bentley@BentleydeMacBook-Pro > ~/Desktop/大一程設作業 > main > python3 HW6-3.py
Object-oriented programming
The wealth of the consumer at this moment = 80
bentley@BentleydeMacBook-Pro > ~/Desktop/大一程設作業 > main >
```

第四題：

程式碼：

```
import matplotlib.pyplot as plt
class Chaos:
    def __init__(self, x0, r):
        self.x, self.r=x0,r
    def update(self):
        self.x = self.r * self.x *(1-self.x)
    def generate_sequence(self, n):
        path = []
        for i in range(n):
            path.append(self.x)
            self.update()
        return path
fig, ax = plt.subplots()
x0=0.1
r=2.5
chaos = Chaos(x0,r)
while r<4:
    chaos.r=r
    t = chaos.generate_sequence(1000)[950:]
    ax.plot([r]*len(t), t, 'b.', ms=0.6)
    r=r+0.005
ax.set_title('Plot the Tail if Transition Rule:  $x_{t+2}$ 
 $=r*x_t*(1-x_t)$ ')
ax.set_xlabel('Parameter ( $r$ )')
ax.set_ylabel('State Space( $x_t$ )')
plt.show()
```

結果：



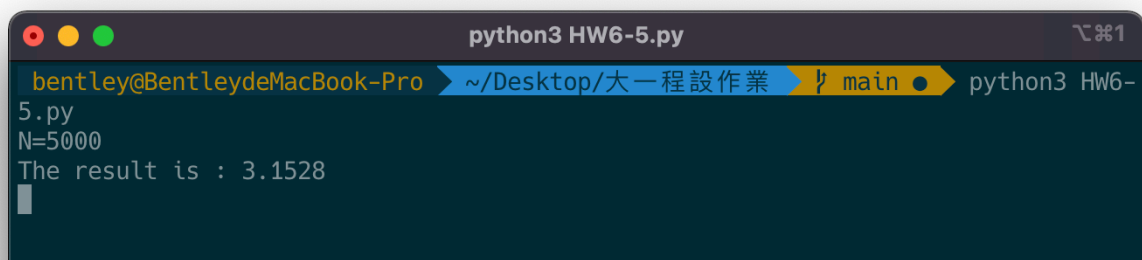
第五題：

程式碼：

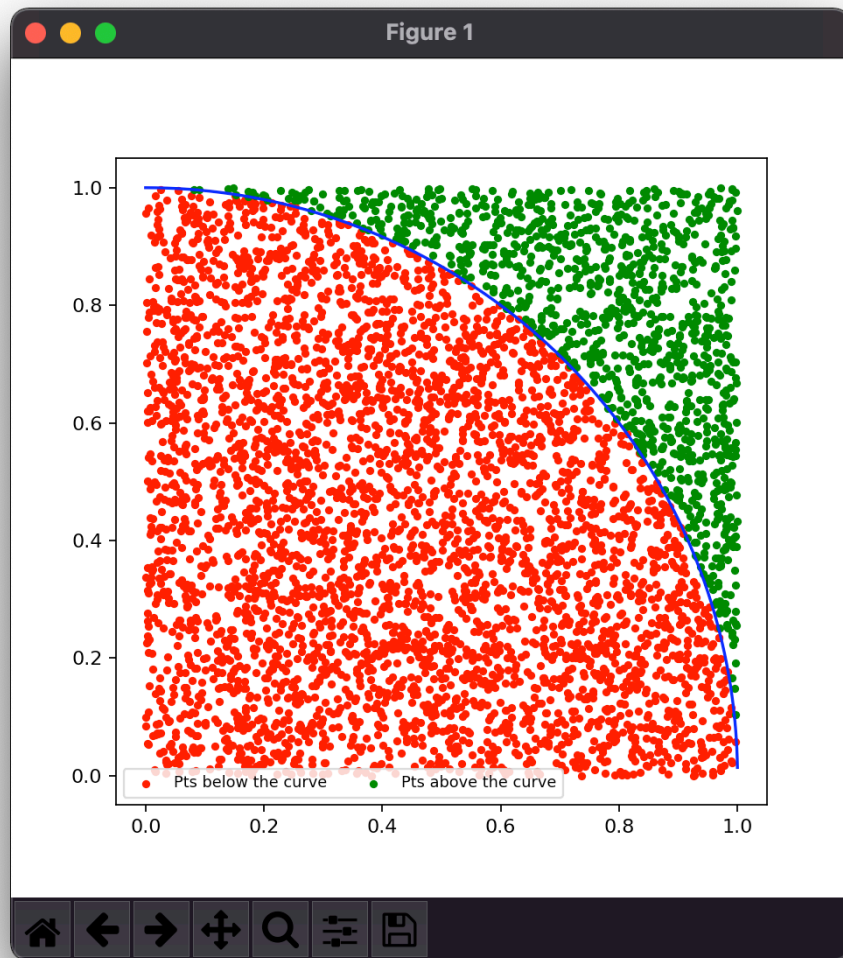
```
import numpy as np
import matplotlib.pyplot as plt
from matplotlib.pyplot import *
figure(figsize=(6, 6), dpi=80)
def f(x):
    return np.sqrt(1-x**2)
N = 5000
x = np.arange(0, 1, 0.0001)
y = f(x)
x_rand = np.random.random(N)
y_rand = np.random.random(N)

ind_below = np.where(y_rand < f(x_rand))
ind_above = np.where(y_rand >= f(x_rand))
bel = np.count_nonzero(y_rand < f(x_rand))
abo = np.count_nonzero(y_rand >= f(x_rand))
pts_below = plt.scatter(x_rand[ind_below],
y_rand[ind_below], color = "red", s=10)
pts_above = plt.scatter(x_rand[ind_above],
y_rand[ind_above], color = "green", s=10)
plt.plot(x, y, color = "blue")
print("The result is : ",end="")
print(4*(bel)/N)
plt.legend((pts_below, pts_above), ('Pts below the
curve', 'Pts above the curve'), loc='lower
left', ncol=3, fontsize=8)
plt.show()
```

結果：



```
python3 HW6-5.py
bentley@BentleydeMacBook-Pro ~/Desktop/大一程設作業 > main
python3 HW6-5.py
N=5000
The result is : 3.1528
```



第六題在下一頁

第六題：

程式碼：

```
import numpy as np
import random
from random import randrange
import matplotlib.pyplot as plt
from matplotlib.pyplot import *
figure(figsize=(8, 6), dpi=80)
def f(x):
    return
np.abs((np.sin((2*np.pi*x)))*5-2*(np.cos(3*(np.co
s((x/np.pi)**2))*3))
N = 10000
x0 = 0
x1 = 10
x = np.arange(0, 10, 0.001)
y = f(x)
fmax = max(y)
x_rand = x0 + (x1 - x0)*np.random.random(N)
y_rand = np.random.random(N)*fmax
ind_below = np.where(y_rand < f(x_rand))
ind_above = np.where(y_rand >= f(x_rand))
bel = np.count_nonzero(y_rand < f(x_rand))
abo = np.count_nonzero(y_rand >= f(x_rand))
pts_below = plt.scatter(x_rand[ind_below],
y_rand[ind_below], color = "red", s=8)
pts_above = plt.scatter(x_rand[ind_above],
y_rand[ind_above], color = "green", s=8)
plt.plot(x, y, color = "blue")
print("N="+str(N)+"\nThe integral of the ugly
function over [0,10] is : ",end="")
print(round(10*fmax*(bel/(bel+abo)),3))
plt.legend((pts_below, pts_above),('Pts below the
curve', 'Pts above the curve'),loc='lower
left',ncol=3,fontsize=8)
plt.show()
```


結果：

```
python3 /Users/bentley/Desktop/大一程設作業/HW6-6.py
bentley@BentleydeMacBook-Pro ~$ python3 /Users/bentley/Desktop/大一程設作業/
HW6-6.py
N=10000
The integral of the ugly function over [0,10] is : 12.236
```

