



## Sample: Python - Numeric Methods

### Problem 1

```
from scipy.sparse import csr_matrix,lil_matrix

def printMatrix(A):
    """
    Printing the Matrix
    """
    print 'MATRIX'
    for i in A:
        row=''
        for j in i:
            row += str(j).rjust(3)
        print row+'|'
    print

# Original Matrix
A=[[11,0,0,0,0,14], [0,0,0,23,0,0], [0,0,0,33,34,0], [0,15,0,0,43,44,0], [0,0,0,0,0,54,0],
[0,0,62,0,0,0,0], [0,0,72,0,0,0,0]]

#Printing the Matrix
printMatrix(A)

#Convert Matrix to csr format
mat = csr_matrix(A)

#Getting crs rows
IA = mat.indptr
JA = mat.indices
AA =mat.data

#output crs rows
print 'Crs representation rows'
print 'IA -',str(IA).rjust(3)
print 'JA -',str(JA).rjust(3)
print 'AA -',str(AA).rjust(3)
print

#Convert Matrix to lil format
lil_mat = mat.tolil()
#output lil rows
print 'LIL representation rows'
print lil_mat.data
print lil_mat.rows
```



OUTPUT

MATRIX

```
| 11 0 0 0 0 0 14|  
| 0 0 0 0 23 0 0|  
| 0 0 0 0 33 34 0|  
| 0 15 0 0 43 44 0|  
| 0 0 0 0 0 54 0|  
| 0 0 62 0 0 0 0|  
| 0 0 72 0 0 0 0|
```

Crs representation rows

```
IA - [ 0 2 3 5 8 9 10 11]  
JA - [0 6 4 4 5 1 4 5 2 2]  
AA - [11 14 23 33 34 15 43 44 54 62 72]
```

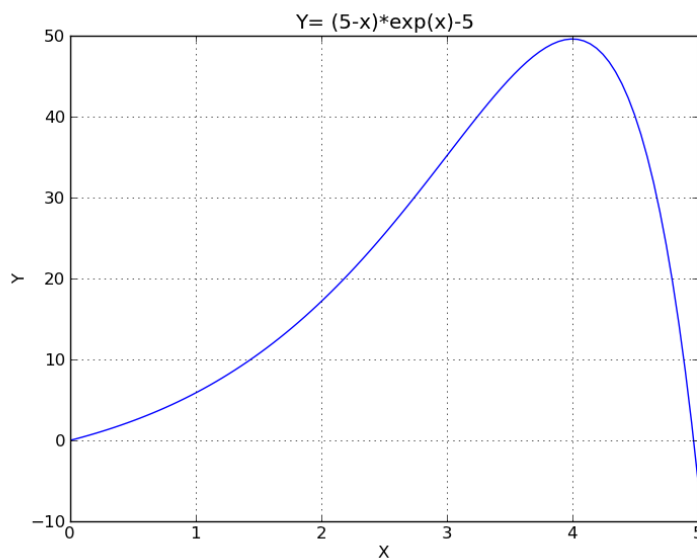
LIL representation rows

```
[[11, 14] [23] [33, 34] [15, 43, 44] [54] [62] [72]]  
[[0, 6] [4] [4, 5] [1, 4, 5] [5] [2] [2]]
```

Problem 2

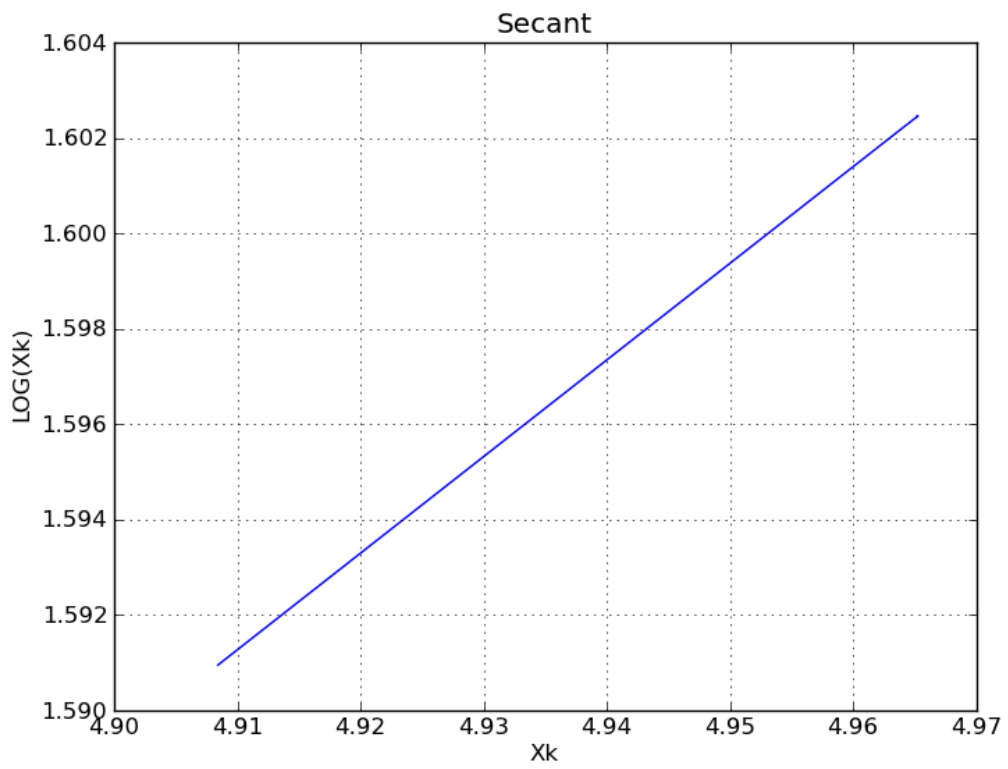
a)  $Y=(5-x)*\exp(x)-5$

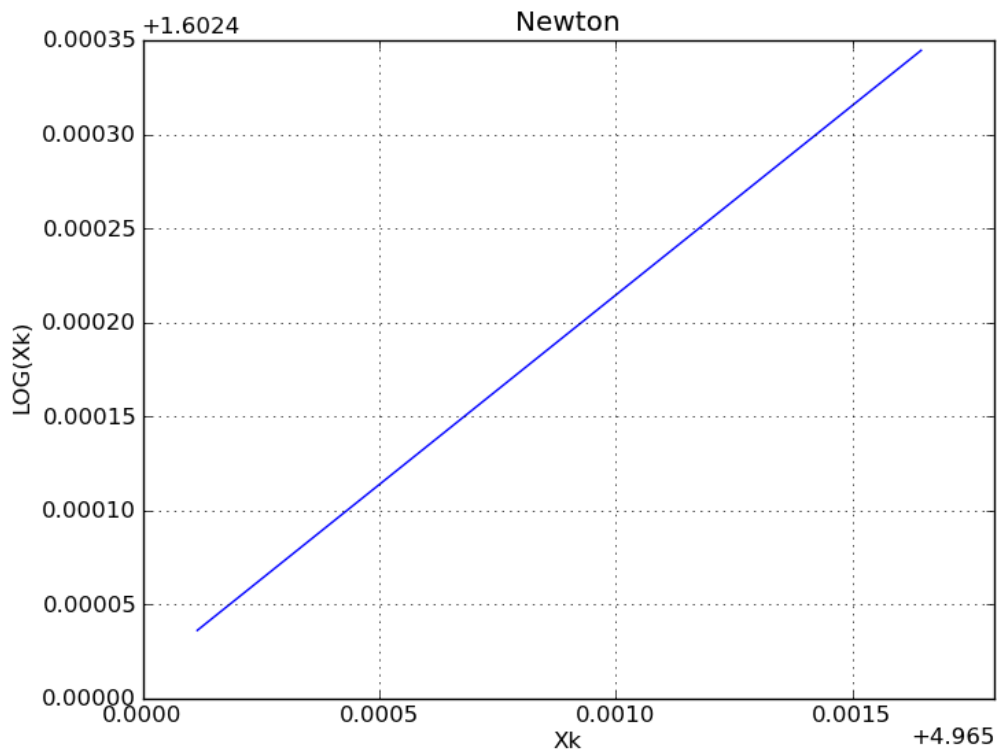
Code in function.py





- b) 4.96511423174  
Code in secant.py
- c) 4.96511423176  
Code in newton.py
- d)  
Code in secant.py  
Code in newton.py





### Problem 3

Here is the code

```
from math import log

def f(x):
    return log((1+x)*1.0/(1-x*x))

def bisection(f,a,b):
    eps = 10**(-8) # accuracy
    max_steps = 100000
    k = 0
    while abs(b-a)>eps:
        x = (a+b)/2 #next guess
        if( f(a)*f(x)>0 ):
            a = x
        else:
            b = x
        #k += 1      #if needed to restrict the number of iterations uncomment this line
    if(k>max_steps):
        break
    return x
print bisection(f,-3.0/4,1.0/4)
```

Answer -7.45058059692e-09 (almost 0)