

## Code

```
import autograd.numpy as np
from autograd import grad

##### PART A #####
def func(x): #  $y = 2 + e^{-bx}\sin(x)$ 
    return 2 + np.exp(-b * x) * np.sin(x)

def slope(x1, x2, y1, y2):
    return (y2 - y1) / (x2 - x1)

b=0.05
x = np.linspace(0, 30, num=100)
slope_of_loch = grad(func)
print("Slope at 0.1 for b=0.05:\n%s" % slope_of_loch(0.1))
print("Slope at 0.01 for b=0.05:\n%s\n" % slope_of_loch(0.01))

b=0.1
x = np.linspace(0, 30, num=100)
slope_of_loch = grad(func)
print("Slope at 0.1 for b=0.1:\n%s" % slope_of_loch(0.1))
print("Slope at 0.01 for b=0.1:\n%s\n" % slope_of_loch(0.01))

##### PART B #####
x = [0,1,2,3,4,5]
y = [10,9,6,4,6,10]

x1 = 1
x2 = 2
print('Slope between x=1 and x=2:\n%s' % slope(x1,x2,y[x1],y[x2]))

x4 = 4
x5 = 5
print('Slope between x=4 and x=5:\n%s' % slope(x1,x2,y[x4],y[x5]))
```

## Results

Slope at 0.1 for  $b=0.05$ :

0.9850747865301321

Slope at 0.01 for  $b=0.05$ :

0.9989504086560138

Slope at 0.1 for  $b=0.1$ :

0.9752197026578588

Slope at 0.01 for  $b=0.1$ :

0.9979515663747239

Slope between  $x=1$  and  $x=2$ :

-3.0

Slope between  $x=4$  and  $x=5$ :

4.0