Assignment-2
Git: https://github.com/iamankan/MA421G.git
Branch: assignments
File: A2P4
P4:

Code:

```
import numpy as np
from numpy import exp, log

# 1
def sigma_1(t: int)-> tuple:
    return exp(t)/(1+exp(t)), 'sigma(t)'

# 2
def sigma_2(t: int)-> tuple:
    return 1/(1+exp(-t)), 'sigma(t)'

# 3
def log_sigma_3(t: int)-> tuple:
    return log(1+exp(-t)), '-ln(sigma(t))'

# 4
def log_sigma_4(t: int)-> tuple:
    if t <= 0:
        return -t + log(1+exp(t)), '-ln(sigma(t))'
    if t > 0:
        return log(1+exp(-t)), '-ln(sigma(t))'

tset = [0,10,-10,100,-100,500,-500,1000,-1000]

for t in tset:
    print(f't: {t}, {sigma_1(t=t)}')
    print(f't: {t}, {sigma_2(t=t)}')
    print(f't: {t}, {log_sigma_3(t=t)}')
    print(f't: {t}, {log_sigma_4(t=t)}')
```

Output:

```
t: 0, (0.5, 'sigma(t) = exp(t)/(1+exp(t))')
t: 0, (0.5, 'sigma(t) = 1/(1+exp(-t))')
t: 0, (0.6931471805599453, '-ln(sigma(t)) = log(1+exp(-t))')
t: 0, (0.6931471805599453, '-ln(sigma_4(t)) = -t + log(1+exp(t))')
```

```
t: 10, (0.9999546021312976, 'sigma(t) = exp(t)/(1+exp(t))')
t: 10, (0.9999546021312976, 'sigma(t) = 1/(1+exp(-t))')
t: 10, (4.5398899216870535e-05, '-ln(sigma(t)) = log(1+exp(-t))')
t: 10, (4.5398899216870535e-05, '-ln(sigma_4(t)) = log(1+exp(-t))')
t: -10, (4.5397868702434395e-05, 'sigma(t) = exp(t)/(1+exp(t))')
t: -10, (4.5397868702434395e-05, 'sigma(t) = 1/(1+exp(-t))')
t: -10, (10.000045398899218, '-ln(sigma(t)) = log(1+exp(-t))')
t: -10, (10.000045398899218, '-ln(sigma_4(t)) = -t + log(1+exp(t))')
t: 100, (1.0, 'sigma(t) = exp(t)/(1+exp(t))')
t: 100, (1.0, 'sigma(t) = 1/(1+exp(-t))')
t: 100, (0.0, '-ln(sigma(t)) = log(1+exp(-t))')
t: 100, (0.0, '-ln(sigma_4(t)) = log(1+exp(-t))')
t: -100, (3.720075976020836e-44, 'sigma(t) = exp(t)/(1+exp(t))')
t: -100, (3.7200759760208356e-44, 'sigma(t) = 1/(1+exp(-t))')
t: -100, (100.0, '-ln(sigma(t)) = log(1+exp(-t))')
t: -100, (100.0, '-ln(sigma_4(t)) = -t + log(1+exp(t))')
t: 500, (1.0, 'sigma(t) = exp(t)/(1+exp(t))')
t: 500, (1.0, 'sigma(t) = 1/(1+exp(-t))')
t: 500, (0.0, '-ln(sigma(t)) = log(1+exp(-t))')
t: 500, (0.0, '-ln(sigma_4(t)) = log(1+exp(-t))')
t: -500, (7.124576406741286e-218, 'sigma(t) = exp(t)/(1+exp(t))')
t: -500, (7.124576406741285e-218, 'sigma(t) = 1/(1+exp(-t))')
t: -500, (500.0, '-ln(sigma(t)) = log(1+exp(-t))')
t: -500, (500.0, '-ln(sigma_4(t)) = -t + log(1+exp(t))')
t: 1000, (nan, 'sigma(t) = exp(t)/(1+exp(t))')
t: 1000, (1.0, 'sigma(t) = 1/(1+exp(-t))')
t: 1000, (0.0, '-ln(sigma(t)) = log(1+exp(-t))')
t: 1000, (0.0, '-ln(sigma_4(t)) = log(1+exp(-t))')
t: -1000, (0.0, 'sigma(t) = exp(t)/(1+exp(t))')
t: -1000, (0.0, 'sigma(t) = 1/(1+exp(-t))')
t: -1000, (inf, '-ln(sigma(t)) = log(1+exp(-t))')
t: -1000, (1000.0, '-ln(sigma_4(t)) = -t + log(1+exp(t))')
```

Warning:

```
/var/folders/br/p4vyyhqs7kg9vnb50rbzwr4r0000gp/T/ipykernel_99817/728629907.p
y:3: RuntimeWarning: overflow encountered in exp
  return exp(t)/(1+exp(t)), 'sigma(t) = exp(t)/(1+exp(t))'
/var/folders/br/p4vyyhqs7kg9vnb50rbzwr4r0000gp/T/ipykernel_99817/728629907.p
y:3: RuntimeWarning: invalid value encountered in double_scalars
  return exp(t)/(1+exp(t)), 'sigma(t) = exp(t)/(1+exp(t))'
/var/folders/br/p4vyyhqs7kg9vnb50rbzwr4r0000gp/T/ipykernel_99817/728629907.p
y:7: RuntimeWarning: overflow encountered in exp
  return 1/(1+exp(-t)), 'sigma(t) = 1/(1+exp(-t))'
/var/folders/br/p4vyyhqs7kg9vnb50rbzwr4r0000gp/T/ipykernel_99817/728629907.p
y:11: RuntimeWarning: overflow encountered in exp
  return log(1+exp(-t)), '-ln(sigma(t)) = log(1+exp(-t))'
```