Lista 05

Erlon Lacerda Avelino
20220071286

Questão 1

```
import matplotlib.pyplot as plt
import numpy as np
```

```
escolha = bool(int(input('(1 para sim // 0 para não)\nDeseja informar o valor
de convergência S? ')))
escolha

Soma = np.nan
epsilon = np.nan

if escolha:
  Soma = float(input('Digite o valor da soma S: '))
  epsilon = float(input('Digite o valor da tolerância epsilon: '))


kmin = np.nan
kmax = np.nan

print('Forneça os valores para kmin e kmax.')
kmin = int(input('kmin: '))
kmax = int(input('kmax: '))
```

(1 para sim // 0 para não)
Deseja informar o valor de convergência S? 1
Digite o valor da soma S: 1
Digite o valor da tolerância epsilon: 0.05
Forneça os valores para kmin e kmax.
kmin: 50
kmax: 60

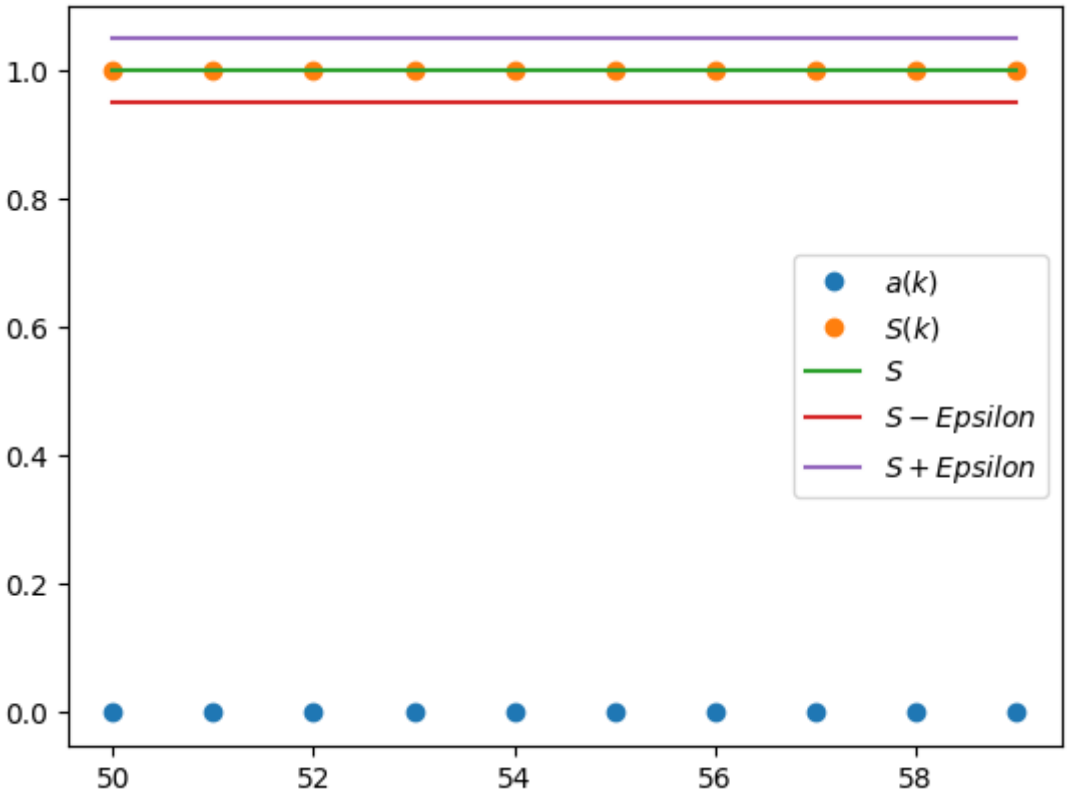
```
def a(k):
    return (1/(2**k))
```

```
def S(k):
  sum = 0
  for i in range(1, k+1):
    sum += a(i)
  return sum
```

```
## cabeçalho
print(f"{'k':<5}{'a(k)':<5}{'S(k)':<5}")

## elementos
for k in range(kmin, kmax):
    print('%.2f %.2f %.2f' % (k, a(k), S(k)))
```

k a(k) S(k)
50.00 0.00 1.00
51.00 0.00 1.00
52.00 0.00 1.00
53.00 0.00 1.00
54.00 0.00 1.00
55.00 0.00 1.00
56.00 0.00 1.00
57.00 0.00 1.00
58.00 0.00 1.00
59.00 0.00 1.00

```
data1 = {'k': list(range(kmin, kmax)), 'a(k)': [a(i) for i in range(kmin,
kmax)]}
plt.plot(data1['k'], data1['a(k)'], marker = "o", linestyle = "None",
label='$a(k)$')
# plt.plot(data['x'], [L for _ in range(kmin, kmax+50)])

data2 = {'k': list(range(kmin, kmax)), 'S(k)': [S(i) for i in range(kmin,
kmax)]}
plt.plot(data2['k'], data2['S(k)'], marker = "o", linestyle = "None",
label='$S(k)$')

if escolha:
  # SOMA
  plt.plot(data1['k'], [Soma for _ in range(kmin, kmax)], label='$S$')
  # plt.text(np.mean(data1['k']), Soma + 0.002, '$S$', ha='center')

  # SOMA INFERIOR
  plt.plot(data1['k'], [Soma - epsilon for _ in range(kmin, kmax)], label='$S -
Epsilon$')
  # plt.text(np.mean(data1['k']), Soma - epsilon + 0.002, '$S - \epsilon$',
ha='center')

  # SOMA SUPERIOR
  plt.plot(data1['k'], [Soma + epsilon for _ in range(kmin, kmax)], label='$S +
Epsilon$')
  # plt.text(np.mean(data1['k']), Soma + epsilon + 0.002, '$S + \epsilon$',
ha='center')

plt.legend()

plt.plot()
plt.show()
```


1.0
0.8
0.6
0.4
0.2
0.0
50
52
54
56
58
a(k)
S(k)
S
S − Epsilon
S + Epsilon

Questão 02 c)

```
def a(k):
    return 2**k
```

```
def S(k):
  sum = 0
  for i in range(0, k+1):
    sum += a(i)
  return sum
```

```
kmin = int(input('kmin: '))
kmax = int(input('kmax: '))
```

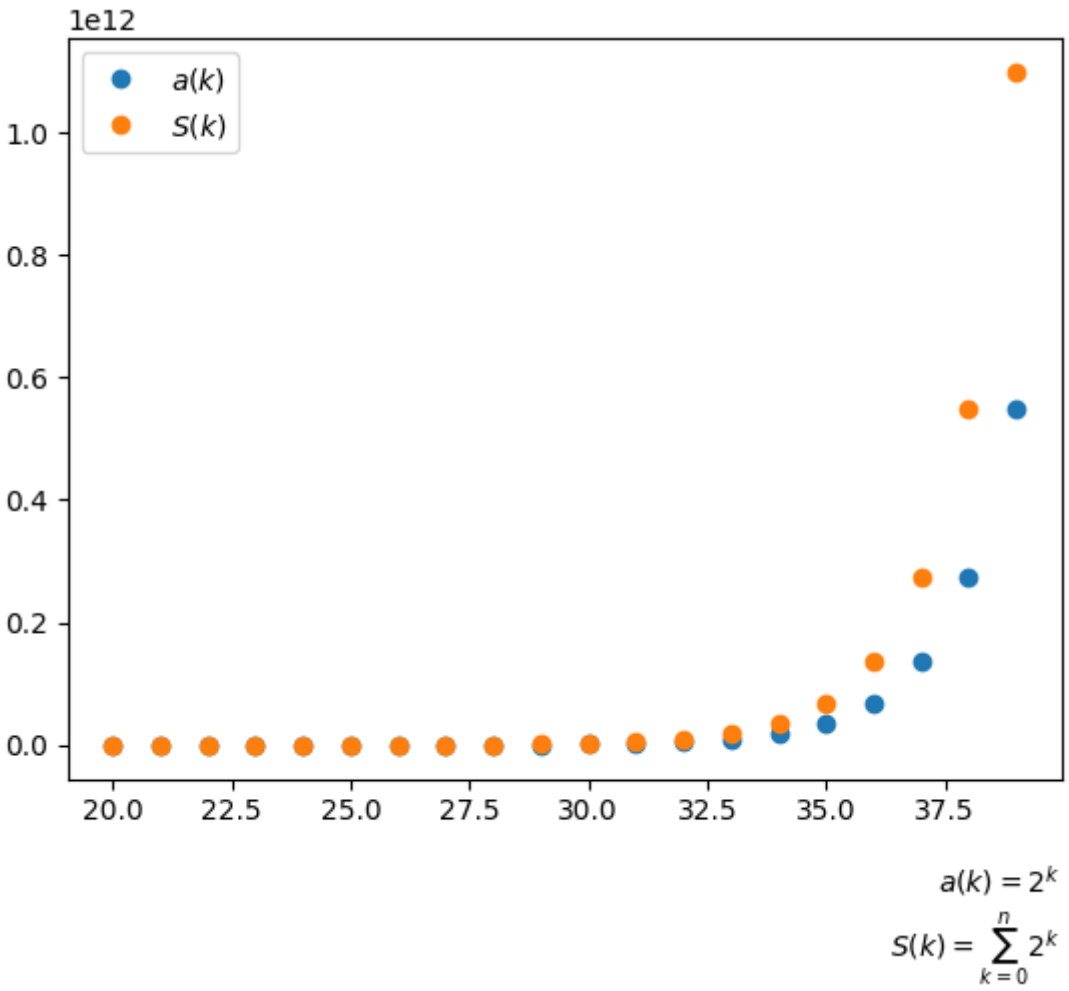
kmin: 20
kmax: 40

```
## cabeçalho
print(f"{'k':<5}{'a(k)':<5}{'S(k)':<5}")

## elementos
for k in range(kmin, kmax):
    print('%.2f %.2f %.2f' % (k, a(k), S(k)))
```

k a(k) S(k)
20.00 1048576.00 2097151.00
21.00 2097152.00 4194303.00
22.00 4194304.00 8388607.00
23.00 8388608.00 16777215.00
24.00 16777216.00 33554431.00
25.00 33554432.00 67108863.00
26.00 67108864.00 134217727.00
27.00 134217728.00 268435455.00
28.00 268435456.00 536870911.00
29.00 536870912.00 1073741823.00
30.00 1073741824.00 2147483647.00
31.00 2147483648.00 4294967295.00
32.00 4294967296.00 8589934591.00
33.00 8589934592.00 17179869183.00

34.00 17179869184.00 34359738367.00
35.00 34359738368.00 68719476735.00
36.00 68719476736.00 137438953471.00
37.00 137438953472.00 274877906943.00
38.00 274877906944.00 549755813887.00
39.00 549755813888.00 1099511627775.00

```
data1 = {'k': list(range(kmin, kmax)), 'a(k)': [a(i) for i in range(kmin,
kmax)]}
plt.plot(data1['k'], data1['a(k)'], marker = "o", linestyle = "None",
label='$a(k)$')
# plt.plot(data['x'], [L for _ in range(kmin, kmax+50)])

data2 = {'k': list(range(kmin, kmax)), 'S(k)': [S(i) for i in range(kmin,
kmax)]}
plt.plot(data2['k'], data2['S(k)'], marker = "o", linestyle = "None",
label='$S(k)$')

plt.annotate('$a(k) = 2^k$\n$S(k)=\sum_{k=0}^n2^k$',
            xy = (1.0, -0.2),
            xycoords='axes fraction',
            ha='right',
            va="center",
            fontsize=10)

plt.legend()
plt.show()
```



Questão 04 d)

```
import numpy as np
```

```
def a(k):
    return ((k)/(np.cos(k)))
```

```
def S(k):
  sum = 0
  for i in range(1, k+1):
    sum += a(i)
  return sum
```

```
kmin = int(input('kmin: '))
kmax = int(input('kmax: '))
```

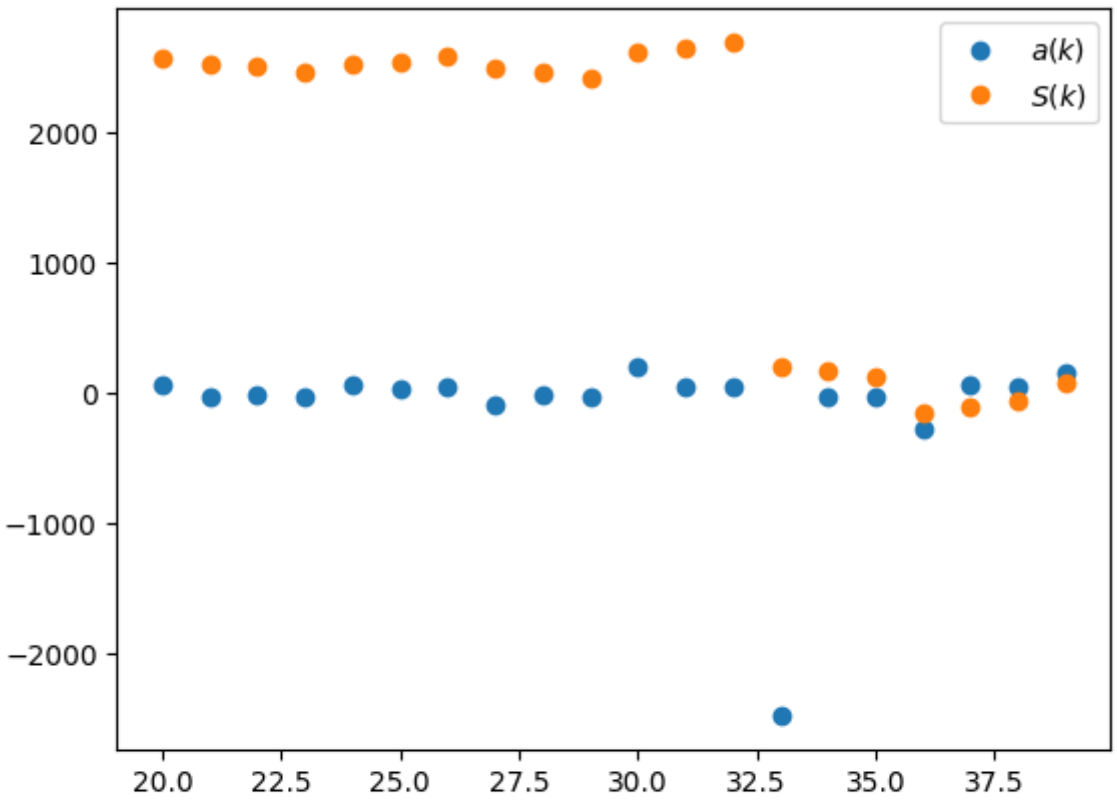
kmin: 20
kmax: 40

```
## cabeçalho
print(f"{'k':<5}{'a(k)':<5}{'S(k)':<5}")

## elementos
for k in range(kmin, kmax):
    print('%.2f %.2f %.2f' % (k, a(k), S(k)))
```

k a(k) S(k)
20.00 49.01 2557.95
21.00 -38.34 2519.61
22.00 -22.00 2497.60
23.00 -43.17 2454.44
24.00 56.58 2511.02
25.00 25.22 2536.24
26.00 40.19 2576.43
27.00 -92.42 2484.01
28.00 -29.09 2454.92
29.00 -38.77 2416.15
30.00 194.49 2610.64
31.00 33.89 2644.53

32.00 38.36 2682.89
33.00 -2485.55 197.34
34.00 -40.07 157.27
35.00 -38.73 118.54
36.00 -281.33 -162.78
37.00 48.34 -114.45
38.00 39.79 -74.66
39.00 146.26 71.61

```
data1 = {'k': list(range(kmin, kmax)), 'a(k)': [a(i) for i in range(kmin,
kmax)]}
plt.plot(data1['k'], data1['a(k)'], marker = "o", linestyle = "None",
label='$a(k)$')
# plt.plot(data['x'], [L for _ in range(kmin, kmax+50)])

data2 = {'k': list(range(kmin, kmax)), 'S(k)': [S(i) for i in range(kmin,
kmax)]}
plt.plot(data2['k'], data2['S(k)'], marker = "o", linestyle = "None",
label='$S(k)$')

plt.annotate('$a(k) = k/cos(k)$\n$S(k)=\sum_{k=1}^nk/cos(k)$',
            xy = (1.0, -0.2),
            xycoords='axes fraction',
            ha='right',
            va="center",
            fontsize=10)

plt.legend()
plt.show()
```



Questão 05 a)

```
def a(k):
    return (2/3)**k
```

```
def S(k):
  sum = 0
  for i in range(1, k+1):
    sum += a(i)
  return sum
```

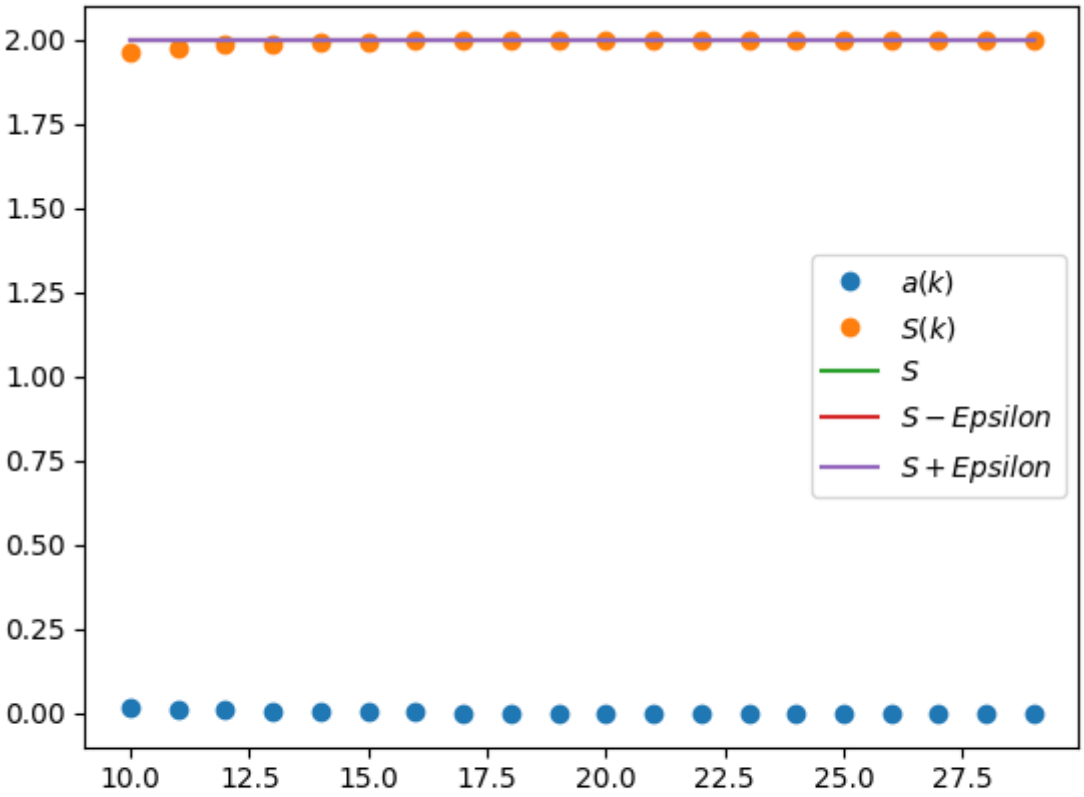
```
kmin = 10
kmax = 30

Soma = 2
epsilon = 10**(-3)
```

```
## cabeçalho
print(f"{'k':<5}{'a(k)':<5}{'S(k)':<5}")

## elementos
for k in range(kmin, kmax):
    print('%.2f %.2f %.2f' % (k, a(k), S(k)))
```

k a(k) S(k)
10.00 0.02 1.97
11.00 0.01 1.98
12.00 0.01 1.98
13.00 0.01 1.99
14.00 0.00 1.99
15.00 0.00 2.00
16.00 0.00 2.00
17.00 0.00 2.00
18.00 0.00 2.00
19.00 0.00 2.00
20.00 0.00 2.00
21.00 0.00 2.00
22.00 0.00 2.00
23.00 0.00 2.00

24.00 0.00 2.00
25.00 0.00 2.00
26.00 0.00 2.00
27.00 0.00 2.00
28.00 0.00 2.00
29.00 0.00 2.00

```
data1 = {'k': list(range(kmin, kmax)), 'a(k)': [a(i) for i in range(kmin,
kmax)]}
plt.plot(data1['k'], data1['a(k)'], marker = "o", linestyle = "None",
label='$a(k)$')
# plt.plot(data['x'], [L for _ in range(kmin, kmax+50)])

data2 = {'k': list(range(kmin, kmax)), 'S(k)': [S(i) for i in range(kmin,
kmax)]}
plt.plot(data2['k'], data2['S(k)'], marker = "o", linestyle = "None",
label='$S(k)$')

# SOMA
plt.plot(data1['k'], [Soma for _ in range(kmin, kmax)], label='$S$')
# plt.text(np.mean(data1['k']), Soma + 0.002, '$S$', ha='center')

# SOMA INFERIOR
plt.plot(data1['k'], [Soma - epsilon for _ in range(kmin, kmax)], label='$S -
Epsilon$')
# plt.text(np.mean(data1['k']), Soma - epsilon + 0.002, '$S - \epsilon$',
ha='center')

# SOMA SUPERIOR
plt.plot(data1['k'], [Soma + epsilon for _ in range(kmin, kmax)], label='$S +
Epsilon$')
# plt.text(np.mean(data1['k']), Soma + epsilon + 0.002, '$S + \epsilon$',
ha='center')

plt.annotate('$a(k) = (2/3)^k$\n$S(k)=\sum_{k=1}^n(2/3)^k$',
             xy = (1.0, -0.2),
             xycoords='axes fraction',
             ha='right',
             va="center",
             fontsize=10)

plt.legend()
plt.show()
```



$$a(k) = (2/3)^k$$

$$S(k) = \sum_{k=1}^{n} (2/3)^k$$