Lista 07

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Questão 1

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

```
a = float(input('Insira o valor de centro a: '))
kmax = int(input('Insira kmax: '))
kmin = int(input('Insira kmin: '))
xmin: float = float(input("Insira xmin: "))
xmax: float = float(input("Insira xmax: "))

if not (kmax - kmin >= 3):
  raise Exception('kmax - kmin deve ser maior ou igual a 3!')
if not ((xmin < a) and (a < xmax)):
  raise Exception('o centro a não está entre xmin e xmax!')
```

```
def func(x):
  return np.sin(x)

def diff_k(f, a, k):
  # Diferenciação numérica
  h = 0.00001
  return (f(a+(h*(k+1))-f(a)) / h)

def taylor(func, a, x, kmax):
  result = np.zeros_like(x)
  for i in range(kmax+1):
    result += (diff_k(func, x, i) * (x - a)**i) / math.factorial(i)
  return result
```

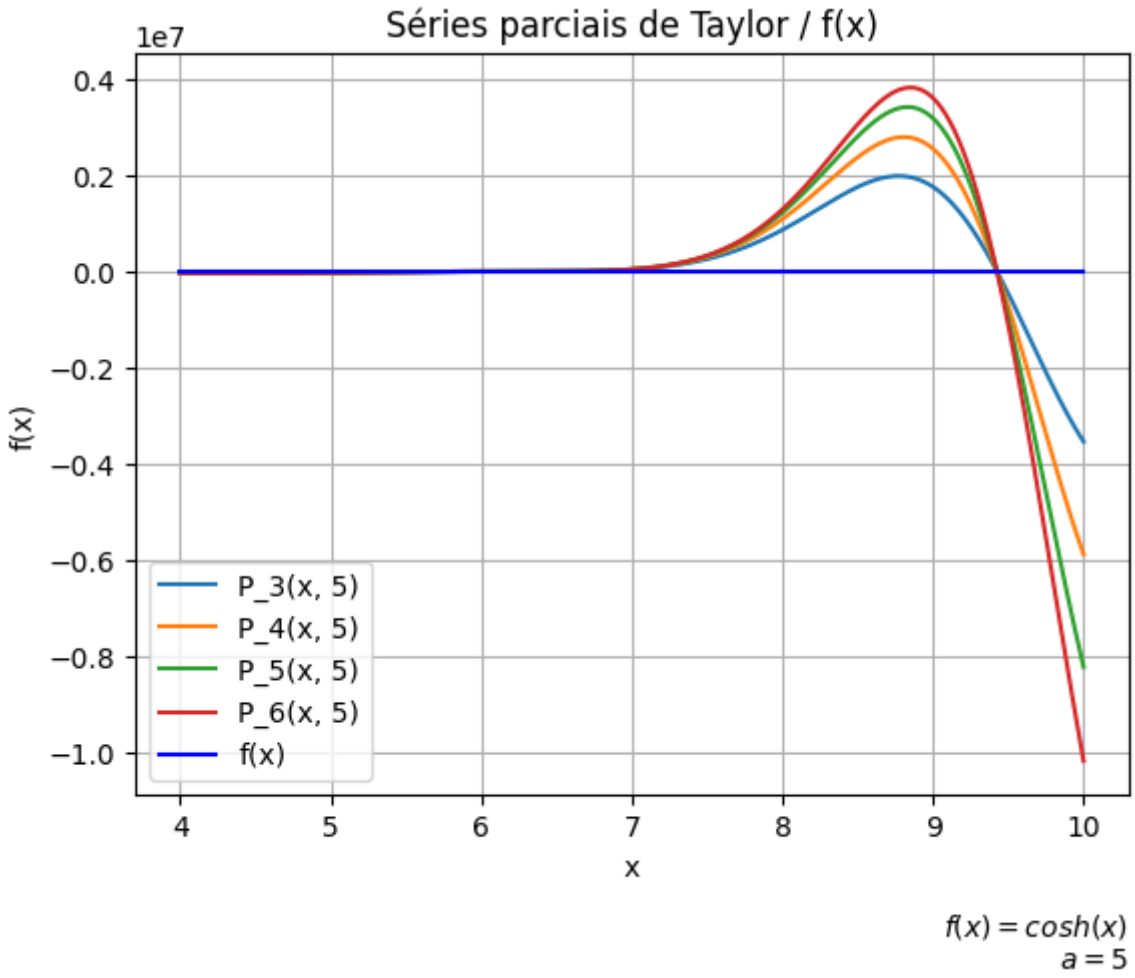
```
x = np.linspace(xmin, xmax, 400)

# Plottagem - Somas parciais
for k in range(kmin, kmax+1, 1):
  plt.plot(x, taylor(func, a, x, k), label=f'P_{k}(x, {a})')

plt.plot(x, func(x), label='f(x)', color='b')
```

```
plt.xlabel('x')
plt.ylabel('f(x)')
plt.title('Séries parciais de Taylor / f(x)')
plt.annotate(f'$f(x) = cosh(x)$\n$a = {a}$',
             xy = (1.0, -0.2),
             xycoords='axes fraction',
             ha='right',
             va="center",
             fontsize=10)
plt.legend()
plt.grid(True)

plt.show()
```



Questão 2 d) (v).

```
a = float(input('Insira o valor de centro a: '))
kmax = int(input('Insira kmax: '))
kmin = int(input('Insira kmin: '))
xmin: float = float(input("Insira xmin: "))
xmax: float = float(input("Insira xmax: "))

if not (kmax - kmin >= 3):
  raise Exception('kmax - kmin deve ser maior ou igual a 3!')
if not ((xmin < a) and (a < xmax)):
  raise Exception('o centro a não está entre xmin e xmax!')
```

```
def func(x):
  return np.cosh(x)
```

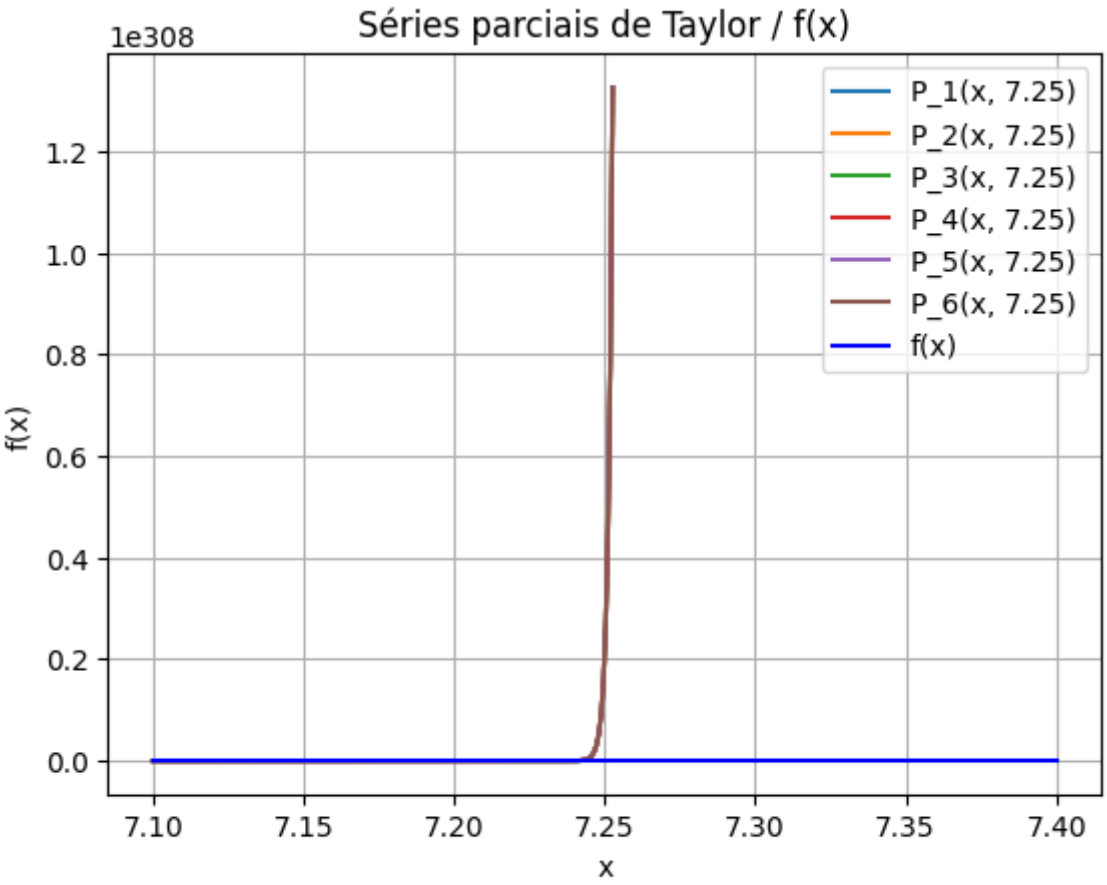
```
x = np.linspace(xmin, xmax, 400)

# Plottagem - Somas parciais
for k in range(kmin, kmax+1, 1):
  plt.plot(x, taylor(func, a, x, k), label=f'P_{k}(x, {a})')

plt.plot(x, func(x), label='f(x)', color='b')

plt.xlabel('x')
plt.ylabel('f(x)')
plt.title('Séries parciais de Taylor / f(x)')
plt.annotate(f'$f(x) = cosh(x)$\n$a = {a}$',
             xy = (1.0, -0.2),
             xycoords='axes fraction',
             ha='right',
             va="center",
             fontsize=10)
plt.legend()
plt.grid(True)

plt.show()
```



$f(x) = cosh(x)$
$a = 7.25$