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import numpy as np
import matplotlib.pyplot as plt

data = np.loadtxt('Donnees.txt', skiprows = 1)

xexp = data[:,0]*1e-2
deltax = data[:,1]*1e-2
Texp = data[:,2]
deltaT = data[:,3]
m = 200*1e-3
l = 28.6*1e-2
g = 9.81
x = np.linspace(9*1e-2, 25*1e-2, 100)

Itheo = m*(x**2 + l**2)
Iexp = m*g*(l-xexp)*(Texp/(2*np.pi))**2
plt.plot(xexp, Iexp, 'o', label='Valeurs expérimentales')
plt.plot(x, Itheo, label='Valeurs théoriques')
plt.plot(x, Itheo+0.007, label='Valeurs théoriques corrigées')
plt.xlabel('Longueur x en m')
plt.ylabel('Moment d'inertie en kg.m²')
plt.errorbar(xexp, Iexp, xerr=deltax, yerr=m*g*(l-deltax)*(deltaT/(2*np.pi))**2, fmt='o')
plt.legend(loc='upper left')
plt.savefig('TP 20.png')
plt.show()

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