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#!/usr/bin/env python3
# -*- coding: utf-8 -*-
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COIS 2310H Assignment 3 Question 4

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```
import q4lib
import numpy as np
import matplotlib.pyplot as plt
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N=15001

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t = np.linspace(0,100,N)
m=1
L=9.81
```

```
theta01=0.2
theta02=0.2
```

```
th1,o1 = q4lib.pendulum_EC(t,mass=m,Length=L,forceq=0.5,driveamp=1.4,theta0=thet
th2,o2 = q4lib.pendulum_EC(t,mass=m,Length=L,forceq=0.5,driveamp=1.5,theta0=thet
```

```
plt.figure(0)
plt.clf()
plt.plot(th1,o1,'b',label="FD = 1.4")
plt.plot(th2,o2,'g',label="FD = 1.5")
plt.title("Speed Vs. Angle of Two Chaotic Pendulums")
plt.xlabel("Angle (rad)")
plt.ylabel("Speed (rad/s)")
plt.legend()
plt.show()
```

```
plt.figure(1)
plt.clf()
plt.plot(t,th1,'b',label="FD = 1.4")
plt.plot(t,th2,'g',label="FD = 1.5")
plt.title("Angle Vs. Time of Two Chaotic Pendulums")
plt.xlabel("Time (s)")
plt.ylabel("Angle (rad)")
plt.legend()
plt.show()
```

```
plt.figure(2)
plt.clf()
dth = np.abs(th2[:]-th1[:])
plt.plot(t,dth,'b')
```

```
plt.title('dtheta vs t')  
print(str(np.argmax(q4lib.lyapunov(t[2:],th1[2:],th2[2:])))
```