nevh

August 13, 2019

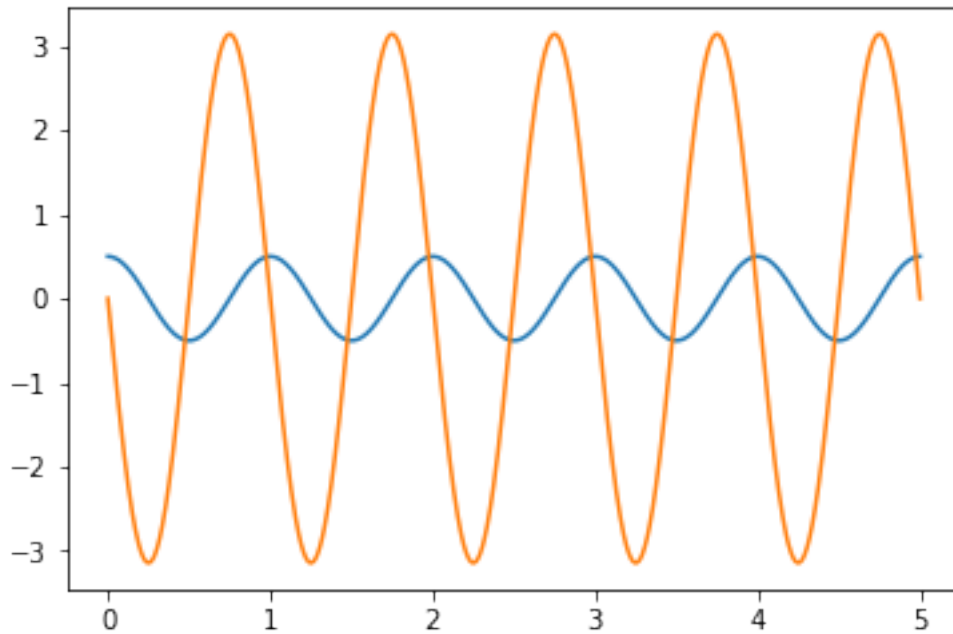# 1 NEVH - Numerical Evolution from the Hamiltonian

```python
In [1]: import numpy as np
        import matplotlib.pyplot as plt
        import sys

        #The following makes modules in src/ accessible from the (current) test/ dir
        sys.path.append("../src")
        import nevh
```

1.1 Simple harmonic motion

```python
In [2]: def H(t,psi,k,m):
            x, p = psi
            return 0.5*k*x**2 + 0.5*p**2/m
```

```python
In [4]: psi0 = np.array([0.5,0])
        dpsi = np.ones(2)*0.05
        # With k=4\pi^2, m=1, the period is 1
        kc = 4 * np.pi**2
        mc = 1
        t, psi = nevh.trajectory(H, psi0, 0, 5, 1000, dpsi, k=kc, m=mc)
        x, p = psi
        plt.plot(t,x,t,p);
```
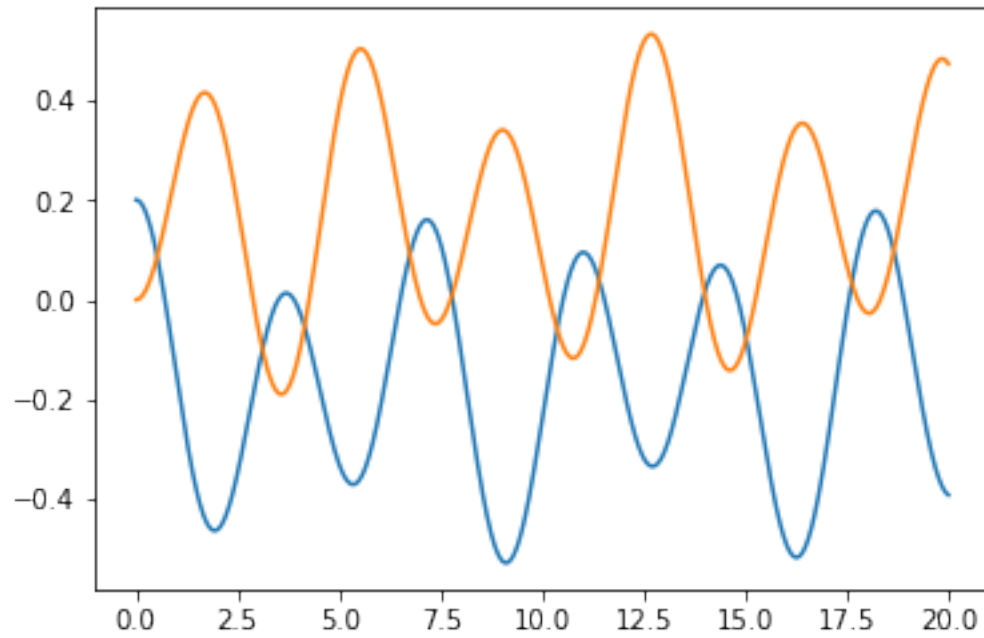
1.2 Two equal coupled oscilators
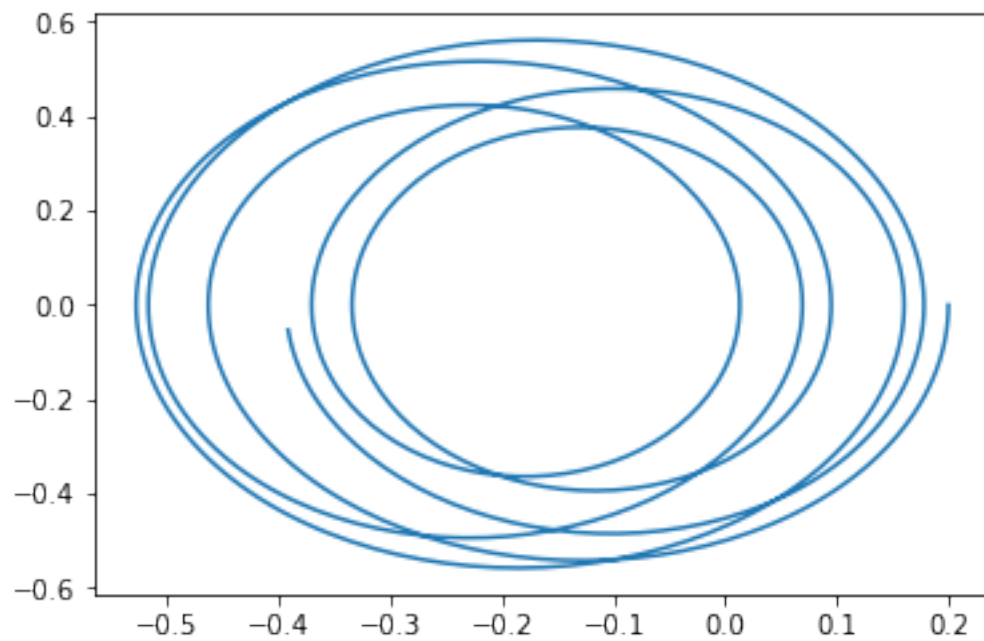
Two equal masses are coupled to one another and to the walls of a box with equal springs.

```
In [5]: def H2(t,s,k,m,L):
            x1, x2, p1, p2 = s
            U = 0.5 * k * ( (x1 + L/6)**2 + (x2-x1 - L/3)**2 + (x2 - L/6)**2)
            T = 0.5 * (p1**2 + p2**2) / m
            return T + U
```

```
In [7]: s0 = np.array([0.2, 0., 0., 0.])
        ds = np.ones(4) * 0.02
        t, s = nevh.trajectory(H2, s0, 0.0, 20.0, 1000, ds, k=1, m=1, L=1)
        x1,x2,p1,p2 = s
        plt.plot(t,x1,t,x2);
```

In [10]: plt.plot(x1,p1); # Phase space trajectory for m1

In [ ]: