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In [5]: import numpy as np
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In [6]: def get_ts(h, w, a):
        def A(h, w, a):
            return np.matrix([[1-h*h*w*w*(1-a), -h*w*(a + (1-a)*(1-h*h*w*w*0.5
            ))], [h*w, 1-h*h*w*w/2]])

        v0 = np.matrix([[0],[1]])

        def xf(A, step):
            return (A**step) * v0

        t = [None]*50
        x = [None]*50

        for i in range(50):
            t[i] = h * i
            x[i] = xf(A(h,w,a), i).item((1,0))
        return t,x
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In [7]: a=0.5
        w=1
        h=np.pi/10
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In [8]: t, x = get_ts(h,w,a)
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In [9]: m = x[0]
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In [11]: import matplotlib.pyplot as plt
         for a in (0, 0.5, 1):
             t,x = get_ts(h, w, a)
             plt.plot(t,x)

         plt.show()
```

