Discrete Logistic Growth

The discreet logistic growth is described by a simple update rule:

$x_{n+1} = x_n + r(1-x_n)x_n$

Depending on r, this iteration may show very strange, and even chaotic behaviour.

This python script

```
# -*- coding: utf-8 -*-
"""
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@author: oliver
"""

import numpy as np
import matplotlib.pyplot as plt

def logGrowthIter(r,x):
    """
    returns next iteration. Takes r and x_n as arguments, returns x_{n+1}
    xn -> xn+1
    """

    return x + r*(1-x)*x

def logGrowthDiscreet(r,N,x0):
    """
    returns the first N iterations, starting with x0. Arguments: r,N,x0
    """

    X = np.zeros(N)
    X[0] = x0

    for i in range(1,N):
        X[i] = logGrowthIter(r,X[i-1])

    return X




if __name__ == '__main__':

    plt.figure()
```

```
Npre = 1000
Nplot = 50

for r in np.linspace(1,3,1000):

    Xpre = logGrowthDiscreet(r,Npre,0.1)
    Xplot = logGrowthDiscreet(r,Nplot,Xpre[-1])
    #plt.plot([r]*Nplot,Xplot,'k.')
    plt.plot([r]*Nplot,Xplot,color='black',linestyle='none',markersize=1,marker='.')

plt.axis([1,3,0,1.5])
plt.draw()
plt.show()
```

produces