Logistic Map

1 Setting Up The Equation

The dynamical equation is as follows: $x_{n+1} = rx_n(1 - x_n)$

where r can be considered akin to a growth rate, x_{n+1} is the population next year, and x_n is the current population.

2 Python Script

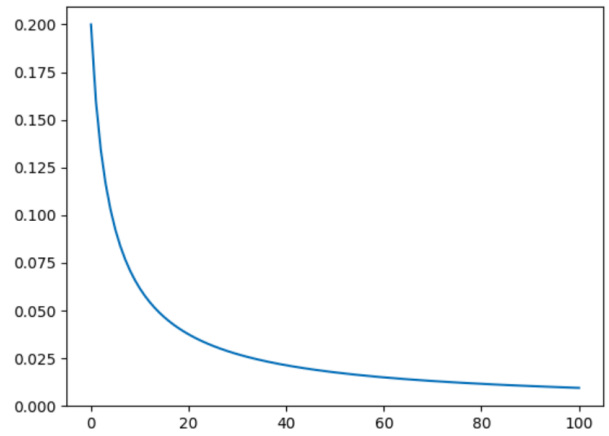
```python
import matplotlib.pyplot as plt

def logistic_map(r, x0, n):
    x = [x0]
    for i in range(n):
        x.append(r * x[-1] * (1 - x[-1]))
    return x

# Example usage
r = int(input("Growth rate = "))
x0 = 0.2
n = 100

x = logistic_map(r, x0, n)
plt.plot(x)
plt.show()
```

Growth rate = 1

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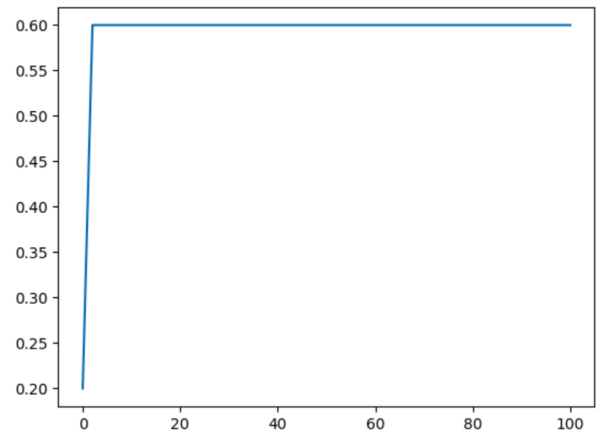
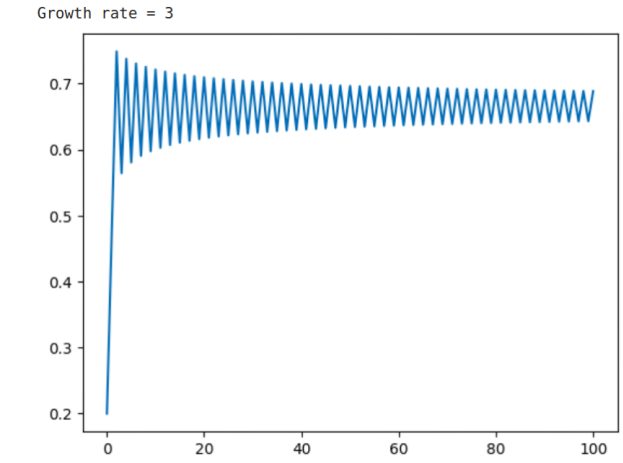
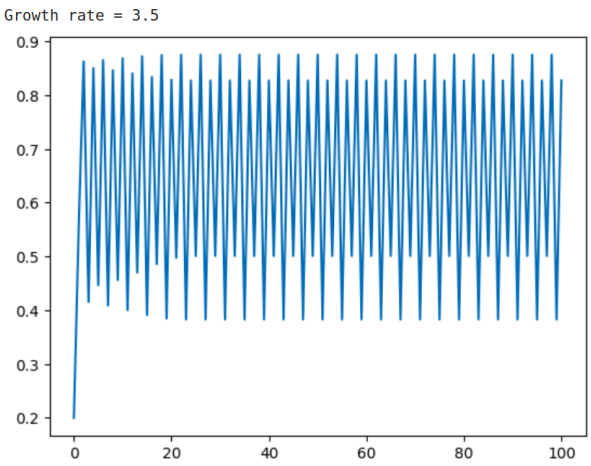
Growth rate = 2.5

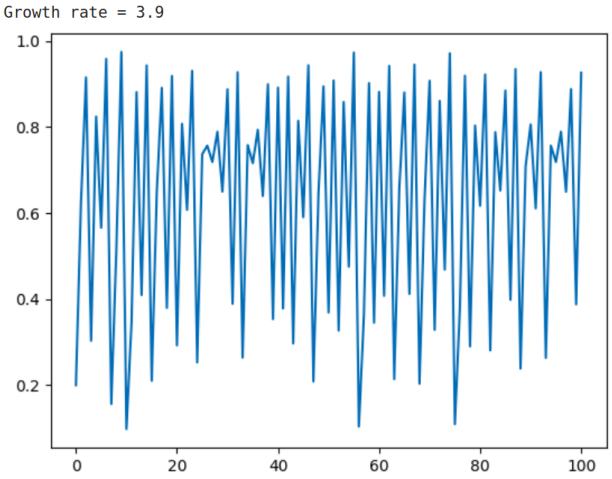


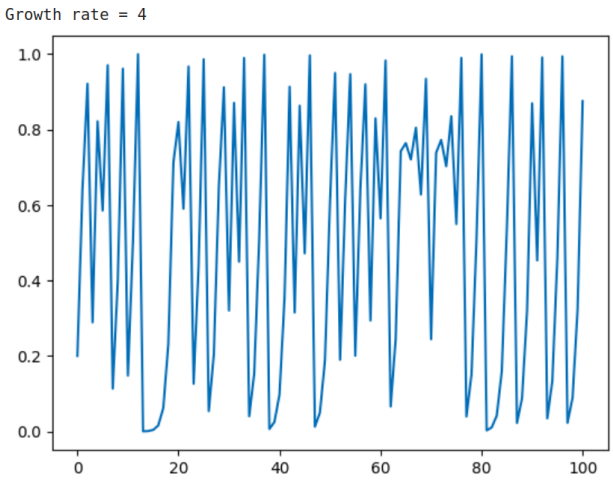
When,

- r = 1. Population Outcome is 1.
- r = 2.5, two output occurs but stables into one again.
- r = 3, two output occurs and stabilizes.
- r = 3.5, four output stabilizes.









As r value increases, the number of outcomes increases. When r approaches 4, the number of outcomes becomes chaotic.