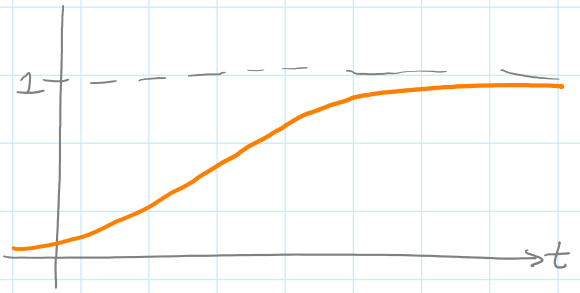
LOGISTIC MAP

population growth model

$$\frac{df}{dt} = r \cdot f(1-f)$$



t = time

r = growth rate

$f(t)$ = population at time t

1 = carrying capacity

discrete model: x_1 = starting value

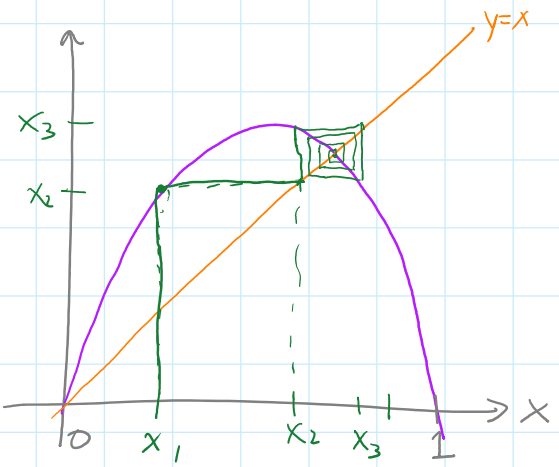
$$x_{n+1} = r \cdot x_n \cdot (1-x_n) \quad \text{for } n \geq 1$$

Investigate: choose starting value $0 < x_1 < 1$ and a growth rate $0 < r < 4$

Iterate: compute $x_2, x_3, x_4, \ldots$

What happens?

Visualization: $h_r(x) = r \cdot x(1-x)$



x_1

$x_2 = h_r(x_1)$

$x_3 = h_r(x_2)$

"cobweb plot"