Mathcad (chaotic?) trajectories

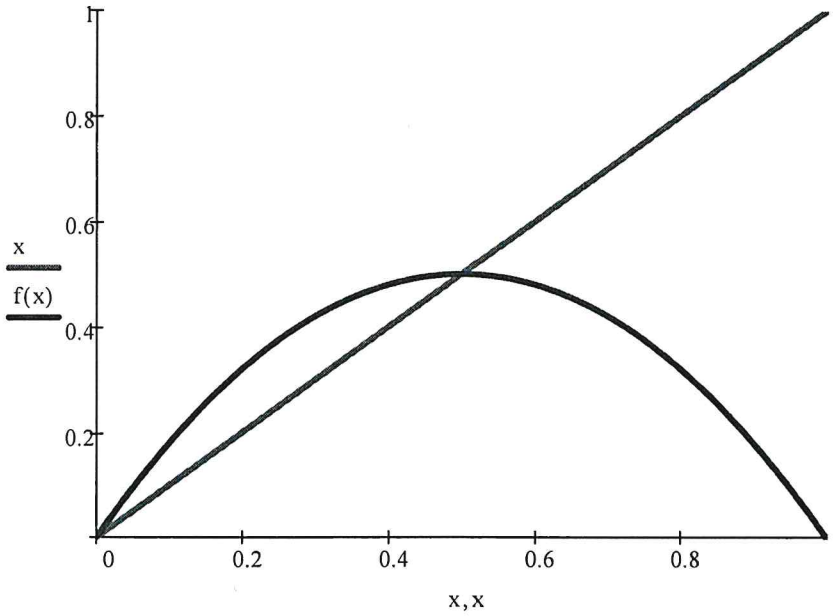
We show how to let Mathcad construct trajectories for a scalar discrete-time dynamic system.

The motion law **x(t+1) = f[x(t)]** can be chosen *ad libitum*. The function **f** is nothing but evolution one. In this worksheet we focus on the case of a logistic model. Two parameters are needed:

parameters $a := 2$ $M := 1$

recommended values, in order to understand are a = 2, 3, 4. I encourage studs in making experiments.

evolution function: $f(x) := a \cdot x \cdot (M - x)$



MACHINERY FOR THE CONSTRUCTION OF THE TRAJECTORY

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$T := 10$ Half the time horizon

$t := 1..2 \cdot T$ $s := 1..T$ $tt := 0..2 \cdot T$

$X_0 := .1$ $\quad Y_0 := f(X_0)$ $\quad Y_0 = 0.18$

$X_{2 \cdot s} := f[X_{2 \cdot (s-1)}]$

$Y_{2 \cdot s} := f(X_{2 \cdot s})$

$X_{2 \cdot s-1} := Y_{2 \cdot (s-1)}$

$Y_{2 \cdot s-1} := Y_{2 \cdot (s-1)}$

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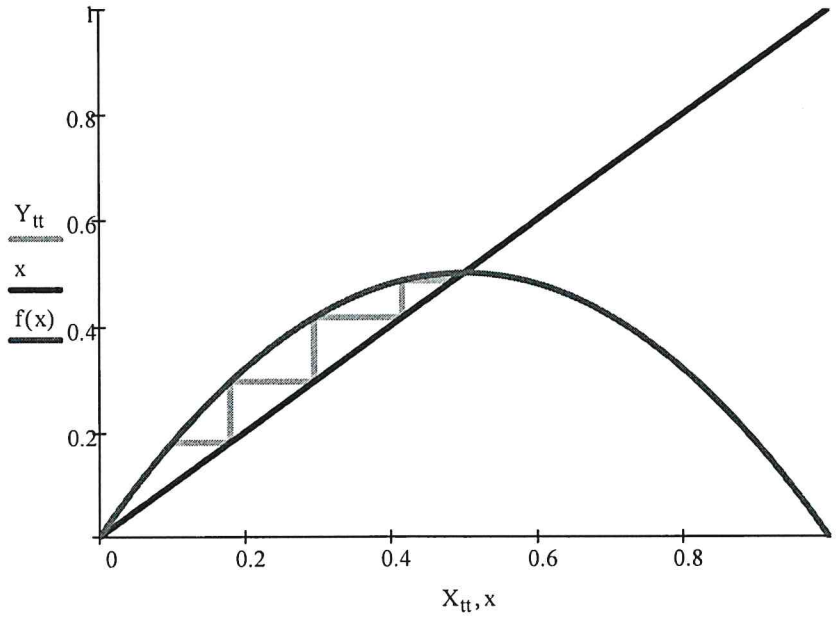
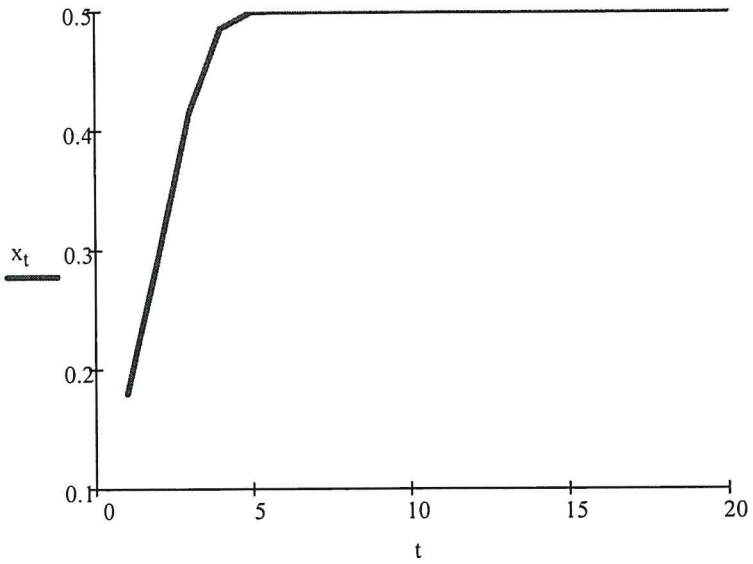
END OF THE MACHINERY



$x_0 := X_0$ $\quad x_0 = 0.1$

$t := 1 .. 2 \cdot T$

$x_t := f(x_{t-1})$


0.5
0.4
0.3
0.2
0.1
x_t
0
5
10
15
20
t