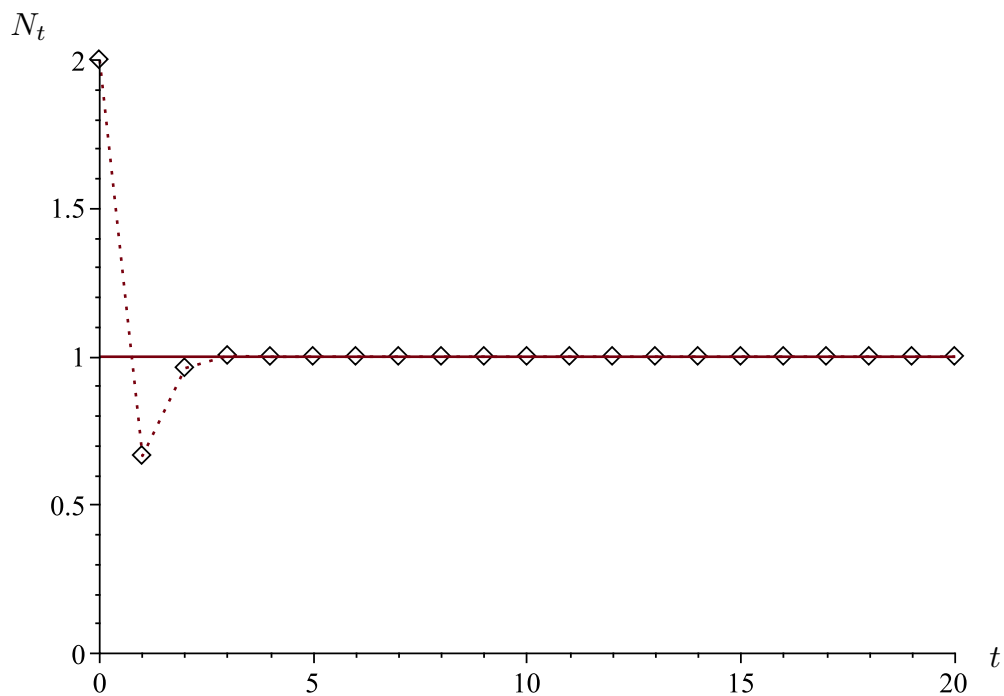


# Exponential Model

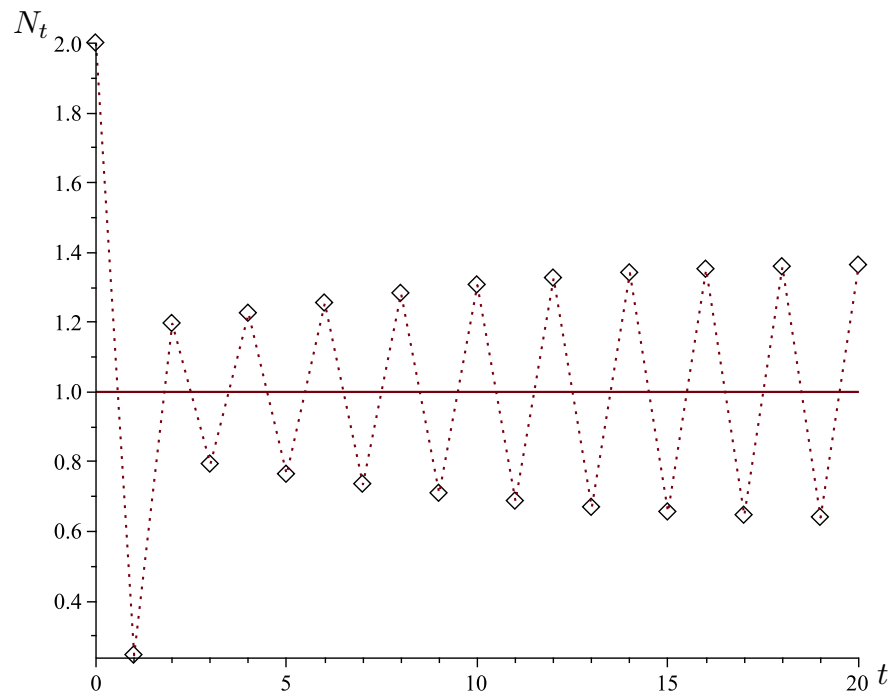
Consider the following normalized exponential model for insect populations:

$$N_{t+1} = N_t \exp(r(1 - N_t)), \quad r > 0. \quad (1)$$



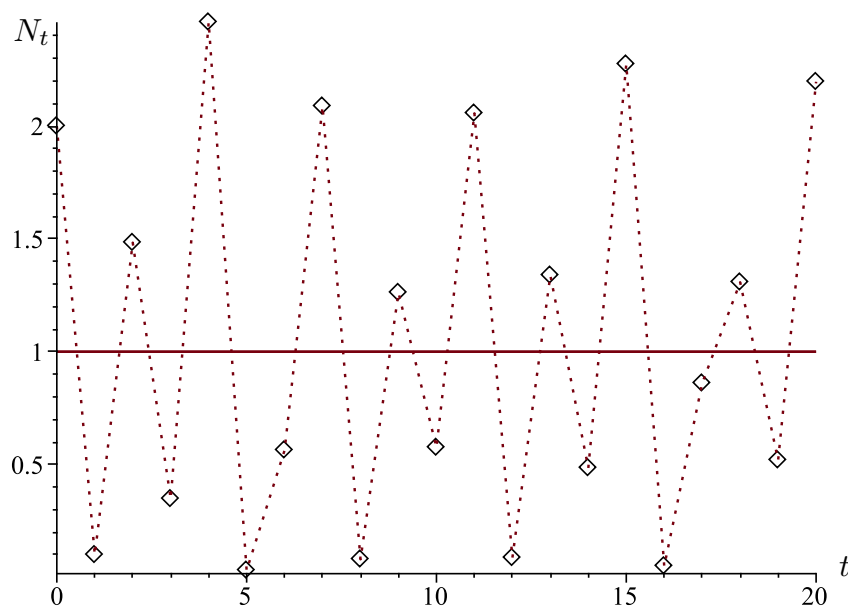
Iterations of (1) with  $r = 1.1$ . Solid line: steady state.

When  $0 < r < 2$ , the steady state  $N_* = 1$  is stable.



Iterations of (1) with  $r = 2.1$ . Solid line: steady state.

When  $r > 2$ , there are no stable steady states. If  $r$  is near 2, a 2-cycle develops, as shown above. If  $r$  is far from 2, the behavior is more chaotic, as shown below.



Iterations of (1) with  $r = 3$ . Solid line: steady state.