MATH 616-010 Modeling in Applied Mathematics
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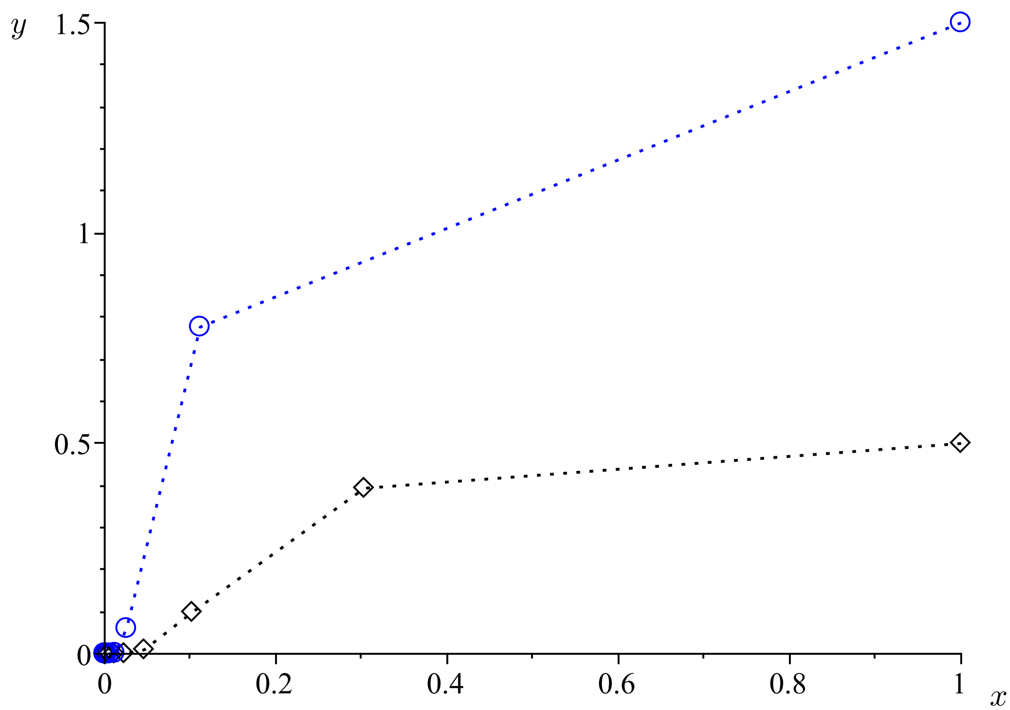
Nicholson-Bailey Model

Consider the Nicholson-Bailey model

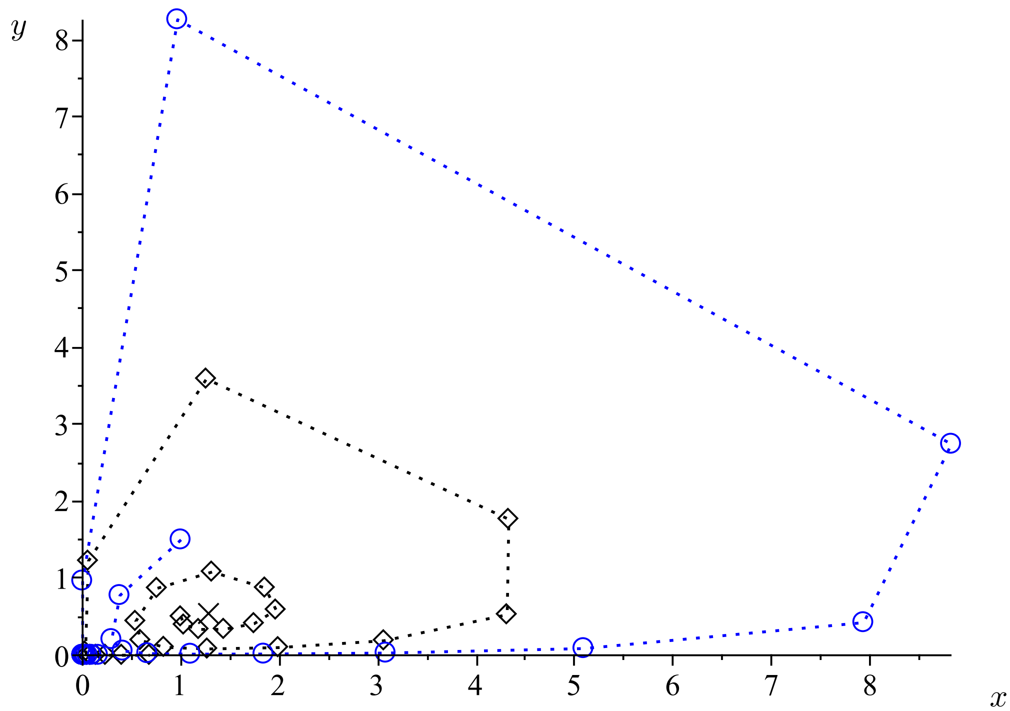
$$x_{t+1} = \alpha x_t e^{-y_t}, \tag{2a}$$
$$y_{t+1} = c(1 - e^{-y_t})x_t. \tag{2b}$$

Trajectories are shown below.



Trajectories of (2) with $\alpha < 1$.

In the case where $\alpha < 1$, the origin is the only fixed point, and all solutions converge to it. (Note that x_0 is always 1 by our scalings.)



Trajectories of (2) with $\alpha > 1$. X marks (x_*, y_*).

In the case where $\alpha > 1$, the fixed point (x_*, y_*) is unstable, as is the origin, so the populations oscillate about (x_*, y_*). (Note that x_0 is always 1 by our scalings.)