Quiz 12

Key

1. A bacterial colony grows at a rate of 70% per hour. Some of the bacteria mutate into a faster-growing species which grow at a rate of 90% per hour. Let b_t be the population size of the original bacteria, and let m_t be the population of the mutated bacteria.

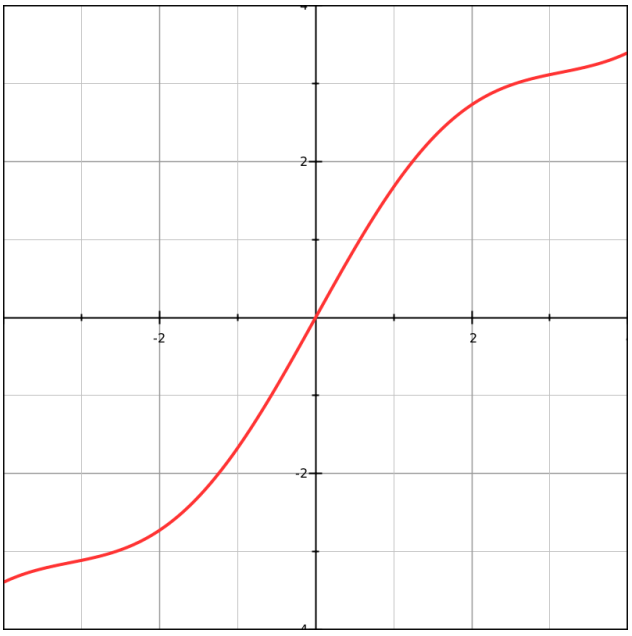
   (a) [2 pts] Write down discrete dynamical systems for b_t and m_t.

   $$b_{t+1} = 1.7b_t$$
   $$m_{t+1} = 1.9b_t$$

   (b) [2 pts] Write down the discrete dynamical system for the fraction p_t of mutated bacteria.

   $$p_{t+1} = \frac{1.9p_t}{1.9p_t + 1.7(1-p_t)}$$

2. [6 pts] Shown below is the updating function for a discrete dynamical system. Identify the equilibria (approximately) and classify them as stable or unstable.



The equilibria are at $x = -3.1, 0$, and 3.1. $x = 0$ is unstable, while both 3.1 and -3.1 are stable.