BEBI5009 Homework4

Due 04/19/2018(Thursday) before class (9am)

1. **Predator-prey model**

   Consider the predator-prey model

$$\frac{dx}{dt} = ax - bxy$$

$$\frac{dy}{dt} = -cy + dxy$$

   where x and y present prey and predator populations, such as biomass or population densities of the species

   a is the net growth rate of the prey population, and c is the net death rate of the predators. Note that in the absence of the predators (when y = 0), the prey population would grow exponentially. If the preys are absence (when x = 0), the predator population would decay exponentially to zero due to starvation.

   The term xy approximates the likelihood that an encounter will take place between predators and prey.

   (a) Find the steady states of the system.

   (b) Find the Jacobian of the predator-prey model at the above steady states, and determine their stability properties.

   (c) Try to interpret the stability results.