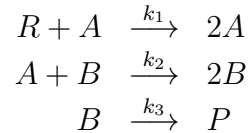# MATH 4780/6780: Mathematical Biology

Online Assignment 1

The assignment is due **Friday 4/3 by 9pm**. Please e-mail your solution to o `caner@uga.edu` with Subject line "online assignment".

1. Consider the following chemical reaction system (Lotka):

$$R + A \xrightarrow{k_1} 2A$$
$$A + B \xrightarrow{k_2} 2B$$
$$B \xrightarrow{k_3} P$$

   Amount of molecule R is kept constant in the following reaction system, and P is the product. Therefore the only molecules of interest are A and B. In other words, your ODE system should contain only two variables, $[A]$ and $[B]$. The rates are given as $k_1[R] = 5$, $k_2 = 0.1$ and $k_3 = 5$.

   (a) Write down the 2×3 state shift matrix V and propensity vector p.

   (b) Derive the ODE that represents this system.

   (c) Find all fixed points.

   (d) Analyze the stability of the fixed points.