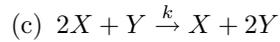
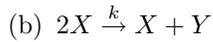
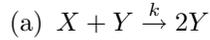


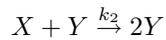
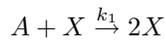
MTH 370, Fall 2009
Homework 9

Instructions: Do these calculations by hand (you may use a computer or calculator for simple arithmetic and function evaluations) and show your work.

1. Write down the mass-action equations for the following chemical reactions:

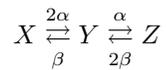


2. Consider the following chemical reactions:



Assuming the concentration of A is kept constant, show that the mass-action equations for these reactions are the same as the Lotka-Volterra model for predator-prey systems. Which chemical is the “prey” and which is the “predator”?

3. Consider the following chemical reactions:



- (a) Write down the mass-action equations for the concentrations x , y and z , and show that $x + y + z$ is constant.
- (b) Show that when $x + y + z = 1$, the steady-state solution of the mass-action equations is a binomial distribution with parameter $p = \alpha/(\alpha + \beta)$.
- (c) What kind of biological system might these reactions describe?