Math 5110 - Fall 2012
Homework Problem Set 7
Due Nov. 27, 2012

1. (a) Use the law of mass action to write the differential equations for the chemical reactions

$$\mathrm{S} + \mathrm{E} \underset{k_{-1}}{\overset{k_1}{\rightleftarrows}} \mathrm{C}_1 \xrightarrow{k_2} \mathrm{E} + \mathrm{P},$$
$$\mathrm{E} + \mathrm{I} \underset{k_{-3}}{\overset{k_3}{\rightleftarrows}} \mathrm{E}_2.$$

   What are the conserved quantities?

   (b) Find the steady state solution in the case that $k_2 = 0$

   (c) Suppose that the system operates in such a way that this (steady state) balance between the components is always maintained, even when $k_2 \neq 0$. What is the rate of production of product P?

   (d) The quantity I is usually identified as a catalytic poison. Why?