MATH 4780/6780: Mathematical Biology

Online Assignment 5

The assignment is due **Thursday 4/16 by 9pm**. Please e-mail your solution to o `caner@uga.edu` with Subject line "online assignment".

1. Analyze the endemic SIR model:

$$\begin{aligned} S' &= \alpha - \beta IS - \alpha S \\ I' &= \beta IS - \gamma I - \alpha I \end{aligned}$$

   (a) This system has three parameters: α, β, γ. Nondimensionalize this system to reduce the number of parameters.

   (b) Find all fixed point(s).

   (c) Analyze the stability of each fixed point (using the trace-determinant plane). The stability of the fixed point(s) may change with respect to the parameter value(s). Identify which parameter range(s) correspond to which type of fixed point(s).

   (d) Use XPP to draw the phase portrait of each different scenario (plot the nullclines and the scaled direction field). A different scenario means that the number or the stability of fixed point(s) are different.