Multi-scale model: Homework assignment

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January 30, 2017

## Introduction

In class we studied a multi-scale model for chronic infections like HIV. A key component of this model is a system of equations for the *within-host dynamics*, i.e., rates of change of uninfected T-cells (T), infected T-cells (U), and viral load (V),

$$\dot{T} = \lambda - kVT - dT \tag{1}$$

$$\dot{U} = kVT - (\mu_p + d)U \tag{2}$$

$$\dot{V} = pU - cV \tag{3}$$

where  $\lambda$  is the production rate of uninfected T-cells, k is the cellular infectivity, d is the background death rate of T-cells,  $\mu_p$  is the excess death rate of infected T-cells due to viral production, and c is virus clearance. We also found the formula for the *burst size*, the number of virions released when the infected T-cell bursts, to be  $N = p/(\mu_p + d)$ .

## Assignment

Find the within-host equilibrium  $(T^*, U^*, V^*)$  by reparameterizing the within-host model in terms of the burst size, setting to zero, and solving for the unknown state variables in terms of the parameters. Group work is encouraged.

Due: February 6, 2017