MCMS Problem Set

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Question 1

Since $[A] = N - [B]$

$$\rightarrow [\dot{B}] = \beta[B] - \frac{\beta[B]^2}{N} - \gamma[B]$$

$$\rightarrow [\dot{B}] = \beta[B] - \frac{\beta[B]^2}{N} - \gamma[B]$$

$$\rightarrow \boxed{[\dot{B}] = \left(\beta - \frac{\beta[B]}{N} - \gamma\right)[B]}$$ Mean Field equation.

Question 2

.) Checking zero equilibrium ($[\dot{B}] = 0$)

$$\left(\beta - \frac{\beta[B]}{N} - \gamma\right)[B] = 0$$

so either $\boxed{[B] = 0}$ or

$$\beta - \frac{\beta[B]}{N} - \gamma = 0$$

$$\beta - \gamma = \frac{\beta[B]}{N}$$

$$[B] = \frac{N}{\beta}(\beta - \gamma)$$

$$\rightarrow [B] = N - \frac{N\gamma}{\beta}$$

$$\rightarrow \boxed{[B] = N - \frac{N}{R_0}}$$

Since $\frac{\beta}{\gamma} = R_0$.