

Homework due Friday Nov 5

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② - Find equilibria and stability for
Consider epidemic model with vital dynamics:

$$\dot{S} = \delta(N-S) - \beta IS + \gamma R$$

$$\dot{I} = -\delta I + \beta IS - \nu I$$

$$\dot{R} = \nu I - \gamma R - \delta R$$

δ = death rate.

(a) Show $\frac{d}{dt}(S+I+R) = \delta(N - (S+I+R))$

and conclude that $S+I+R \rightarrow N$ as $t \rightarrow \infty$

(b) Since $S+I+R \rightarrow N$ set $R = N - (S+I)$
use this to reduce the model to
2 variables S, I

(c) Find equilibria & stability
What is the reproductive rate σ ?

③ - $\dot{x} = (ax^{r-1})x$ Here ϕ Fitness is ax^{r-1} , by^{r-1}
 $\dot{y} = (by^{r-1})y$ Let $\phi = ax^{r-1} + by^{r-1}$

consider $\dot{x} = x[ax^{r-1} - \phi]$, $\dot{y} = y[by^{r-1} - \phi]$
Study equilibria & stability for $0 \leq r < \infty$