Introducing the SIR Model

Differential Equations

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Last week was an introduction to the Lotka–Volterra predator-prey model. I gave you two coupled ODEs and asked you to dissect the equations and figure out what is going on. Today, we'll do this the other way around. I'll describe a situation and then your task is to come up with a system of ODEs.

Here's the scenario:

- There are three states that people can be in:
    1. Susceptible. These are people who haven't gotten the disease yet.
    2. Infected. These people have the disease and can transmit it to others
    3. Recovered. These are people who have had the disease but are no longer infectious, and thus they can't get other people sick.
- The total population remains constant.
- The model has three parameters:
    1. N: The population size
    2. γ: The rate at which infectious people recover
    3. β: A constant related to how infectious the disease is.

Try to come up with a system of coupled ODEs that captures the above scenario.