BIO Capstone Proposal

Effects of different degrees of social distancing on the peak value of the I(t) curve in the SIRD model.

The SIRD model can be represented by the following

$$N = S(t) + I(t) + R(t) + D(t)$$

$$\frac{dS}{dt} = -\frac{\beta SI}{N}$$

$$\frac{dI}{dt} = \frac{\beta SI}{N-D} - \gamma I - \mu I$$

$$\frac{dR}{dt} = \gamma I$$

$$\frac{dD}{dt} = \mu I$$

$$\beta = a \times b \times \frac{S}{N} = \frac{abS}{N}$$

Independent Variables

b is the number of people an infected person can contact each day.

Controlled Variables

N is the total population at the beginning of the pandemic. (World population)

γ is the recovery rate of this disease.

μ is the mortality rate of this disease.

a represents the probability a susceptible person is infected after close contact.

Functions

S(t) is the population susceptible to the new disease at given time t. The initial value is the current estimates of susceptible population.

I(t) is the population infectious with the new disease at given time t. This initial value is based on current extrapolation of the population that has been tested.

R(t) is the population no longer susceptible to the new disease at given time t due to immunity.

D(t) is the population no longer susceptible to the new disease at given time t due to death. This is the current reported death toll.

Dependent Variable

The dependent variable is the peak of I(t).

Methodology

The methodology is to use the initial values, constants, and the independent variable to find the curve I(t) and its peak using calculus.

The max value of I(t) according to the value of b will be the end product.