LSU Math Circle: Research Proposal

Modeling the COVID-19 Pandemic

Instructor: Jacob Davis
Session Offered: June 13 - July 2, 2022
Category: Epidemiology (Calculus required)

Abstract: The COVID-19 Pandemic has caused a boom in the fields of epidemiology and disease dynamics. Mathematicians have used different methods to track and model past pandemics for years. Researchers finally have new relevant data to understand, and now high schoolers get their chance.

The SIR Model is a basic model, given as

\[
\frac{dS}{dt} = -rSI, \quad \frac{dI}{dt} = rSI - aI, \quad \frac{dR}{dt} = aI,
\]

where \( r > 0 \) is the infection rate and \( a > 0 \) is the removal rate of infectives. In this model, we have three distinct classes: Susceptible (S), who can catch the disease; Infectives (I), who have the disease and can transmit it; and the Removed (R), who have recovered, are immune, or isolated until recovered.

Using this model, we will ask the following questions:
- Can this model accurately predict the first 100 days of the pandemic?
- Can we then use this model to predict the remainder of the pandemic?
- How can quarantining (decrease in \( r \)) or a more susceptible population (decrease in \( a \)) affect the outcome of the model?

REFERENCES