

1. PROJECT 3

1.1. **Problem 1.** The SIR (susceptible, infected, recovered) model for epidemics was proposed in 1927 by Kermack and McKendrick. The equivalent discrete system is:

$$\begin{aligned}S_{n+1} &= S_n - \beta S_n I_n \\I_{n+1} &= I_n + \beta S_n I_n - \alpha I_n \\R_{n+1} &= R_n + \alpha I_n\end{aligned}$$

Set up a spreadsheet to simulate a discrete SIR model with the following assumptions:

- In the first month, there are 50,000 susceptible, 500 infected, and 100 recovered individuals.
- In the second month, there are 49,965 susceptible, 530 infected, and 105 recovered individuals.

Use the spreadsheet to answer the following questions:

- In what month does the number of infected individuals peak?
- What is the highest percentage of the population that is infected?
- After 10 years (120 months), what percentage of the population is recovered?
- After 10 years, what percentage of the population is susceptible?
- After 10 years, what percentage of the population is infected?