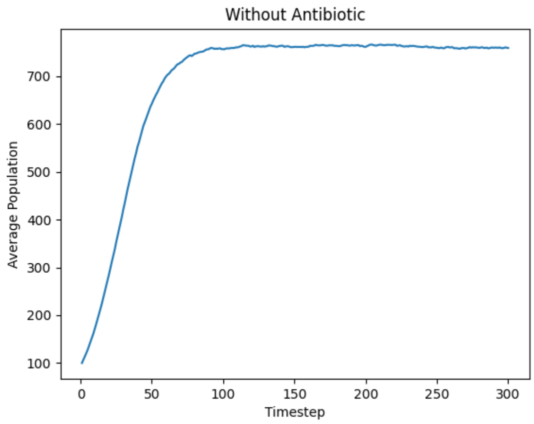

Figure 1 - **Problem 2**

95% confidence interval for Problem 2
total population: (761.86, 3.8303)

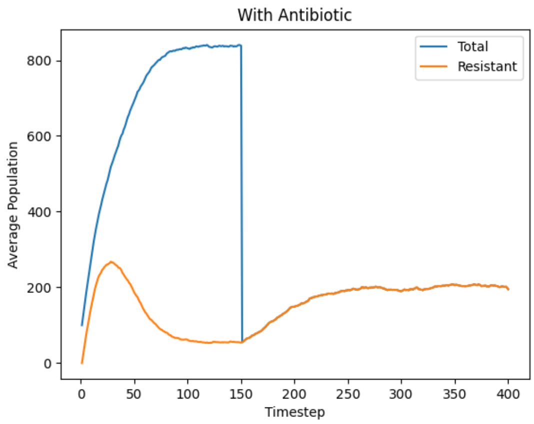

Figure 2- **Problem 5 | Simulation A**

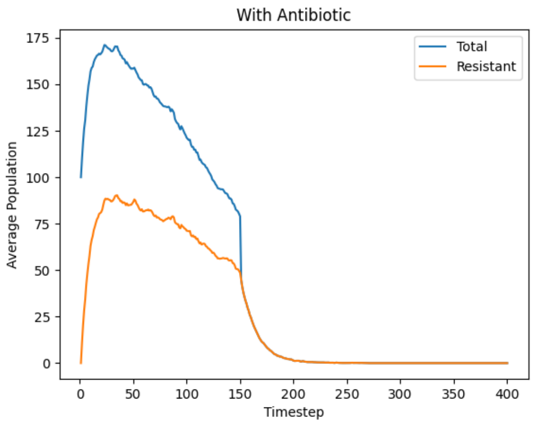

Figure 3 - **Problem 5 | Simulation B**

95% confidence interval for Simulation A
total population: (189.9, 8.9111)
resistant population: (189.9, 8.9111)

95% confidence interval for Simulation B
total population: (0.0, 0.0)
resistant population: (0.0, 0.0)

1. Initially, the total populations in both simulations experience rapid growth. However, due to an inequality in birth probability, simulation A reaches a higher value (around 820) compared to simulation B (around 170). Following the peak point, relative to the birth probability and death probability values, simulation A maintains a horizontal trend until the administration of antibiotics. Conversely, simulation B starts to decline after reaching the peak point for the same reason.

2. The population trend of resistant bacteria is almost same with the general population but with lower values. However, after a certain period (40 in this case), it begins to decline and levels off until the administration of antibiotics to the patient. Subsequently, a new horizontal line is established at a different point.

3. In both simulations, following the administration of antibiotics, only the bacterias that are already has resistant survive.

4. In simulations A and B, the only difference lies in the birth probabilities, with A having a probability of 0.3 and B having a probability of 0.17. Both simulations share the same death probability of 0.2. Following the administration of antibiotics, due to the disparity in birth rates, the bacterial population in simulation A increases, while the population in simulation B decreases. Over time, approximately 230 steps in this instance, the population in simulation B eventually drops to zero.