

# Introduction to Mathematics for Data Science

## Personal Assignment 1

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### 1 Question 1

#### 1.1 Modelling Bird Population Decline Due to Invasive Snakes

To model the bird population over time until extinction, I use a logistic growth model, which is commonly used to describe population growth and decline. The logistic growth model is expressed as:

$$P(t) = \frac{K}{1 + \frac{K-P_0}{P_0} \cdot e^{-rt}}$$

Where:

- $P(t)$  is the population at time  $t$ .
- $K$  is the carrying capacity, representing the maximum sustainable population size.
- $P_0$  is the initial population at  $t = 0$ .
- $r$  is the growth rate parameter.
- $t$  is time.

In your scenario, the bird population is declining due to the invasive snake species, so you'll need to use a negative growth rate ( $r < 0$ ). The population starts at a certain level ( $P_0$ ) and gradually approaches zero as time progresses.

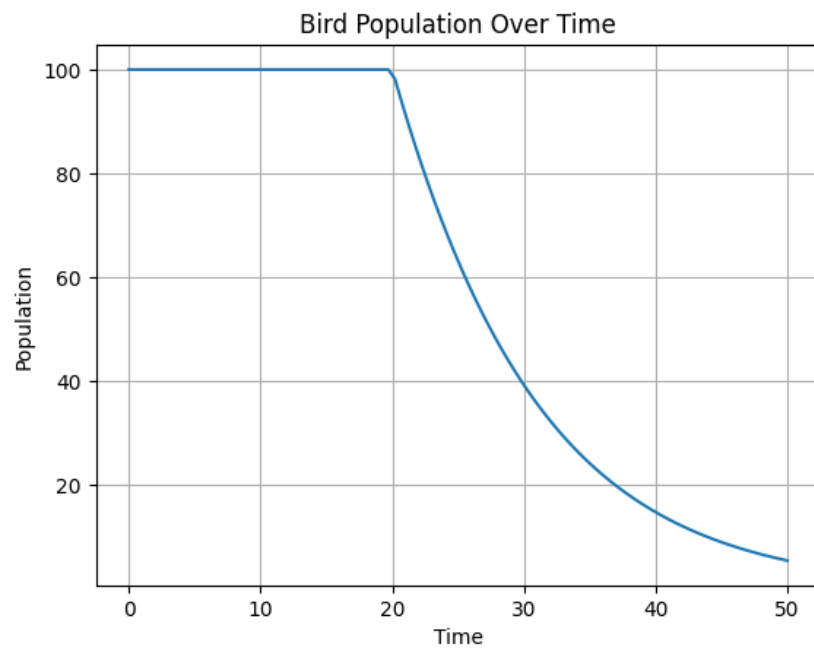


Figure 1: Bird Prediction Graph

Here's a Python function that models the bird population over time using the logistic growth model and plots it: