

**BIO 480/680 Lab Exercise 1**  
**Exponential Growth Model**  
Due date: 07 February 2025

This is primarily an exercise to get you started working with the computer - writing and running a simple program. The idea is to develop a model for a population of small rodents. We will assume that the population can be represented by a simple growth equation where the population produces offspring depending on the population size (see Haefner, Sec 2.3 on pp. 24-27).

The model is described by this equation:

$$N_{t+1} = N_t + rN_t \quad (1)$$

where  $N$  is the number of animals in the population,  $t$  is the time, and  $r$  is the growth rate coefficient (in your text, this is called the *intrinsic per capita growth rate*). At the starting time ( $t = 0$ ), the population will have 2 organisms. In other words,  $N_0 = 2$ .

Assume that the rodents' reproductive rate is 50% per month ( $r = 0.5$ ). Therefore our unit for time is the month.

The task, here, is to write a program to solve the model (Equation 1) for times up to 10 months.

For your report, I suggest you provide results in the form of a table that would also include experimental results (observed, not all months were observed) - see the sample table below for one possible way of presenting your results. In addition, include a list of the program that you wrote.

| Time<br>(months) | Observed | Model |
|------------------|----------|-------|
| 0                | 2        | 2     |
| 1                |          | ?     |
| 2                | 5        | ?     |
| 3                |          | ?     |
| 4                |          | ?     |
| 5                |          | ?     |
| 6                | 20       | ?     |
| --               |          | ?     |
| 10               | 109      | ?     |

For the conclusions, it will be important for you discuss how well the model compares to the observed results. What might be a weakness of this model? Would the model predict unlimited growth with time?