

BIO 480/680 Lab Exercise 6
Euler's Method and the Logistic Model
Due date: 28 March 2025

This week's project will revisit the logistic population model discussed earlier, but with the model represented as an ordinary differential equation (ODE) instead of the finite difference equation (FDE). The ODE model would be:

$$\frac{dN}{dt} = rN \left(1 - \frac{N}{K} \right)$$

Use this set of values for the model parameters:

$$r = 1.5 \text{ per month}$$
$$K = 100$$

Also use this initial population size (at $t = 0$):

$$N_0 = 2$$

We will also want to run the model to a time of 30 months, but in this case we will be experimenting with the time step size used in Euler's method (Δt). Try the following values and note that the corresponding number of steps will have to change in order to reach the same final time:

step size (Δt)	total steps
0.1	300
0.5	60
1.0	30
2.0	15

Write your program to carry out Euler's method and solve this model. You will make four runs, corresponding to the above four step sizes. In your results for each step size, draw a graph showing population size versus time. You could plot all four lines on the same graph. Make sure your program has the section to save data to a file or draw the graphs within the program.

For your conclusions, discuss how the solution changed with step size and think about how the accuracy of Euler's method depends on step size.