1. **Carrying capacity**
One hundred individiuals of some species arrive at an island and establish a new population of size s, where the development of s in time (measured in years) can be described by the ODE
$$\dot{x} = 0.8 \cdot x - 0.0002 \cdot x^2.$$
   (a) Calculate the carrying capacity of this population.
   (b) How long will it take until the population has a size of 1000 individuals?

2. **Constant harvesting model**
The classical constant harvesting model introduces to the logistic growth a constant number of individuals $Y_0 > 0$ that are harvested at each time point. The differential equation for the population size x becomes:
$$\dot{x} = r \cdot x \left(1 - \frac{x}{K}\right) - Y_0$$
   (a) Find the fixed point(s) and check whether they are stable.
   (b) What is the maximum sustainable value for the harvesting parameter Y_0?

3. **Allee effect**
Consider the following differential equation for the population size N:
$$\dot{N} = b \cdot N^2 \cdot \left(1 - \frac{N}{K}\right) - m \cdot N$$
with b, m and $K > 0$.
   (a) Find the fixed point(s) and check whether they are stable.
   (b) What is the Allee effect and what are the characteritics of this model that fit the Allee effect?