1. Given that \( \frac{dP}{dt} = \sqrt{P} \) and \( P(0) = 100 \), use Euler’s Method with \( \Delta t = 2 \) to obtain an estimate for \( P(10) \).

2. Suppose that 200 rabbits are released on Lady Tottington’s estate, and that the population of these rabbits grows logistically with an intrinsic growth rate of 4% per month and a carrying capacity of 1000 rabbits.

   (a) Let \( R \) represent the number of rabbits on her estate \( t \) months after the initial release. Determine a differential equation with initial condition to model this population of rabbits.

   (b) Sketch a plausible graph for this population of rabbits.

3. The population of a town is currently 600, but is projected to grow by 30 people per year from now on.

   (a) Determine a differential equation with initial condition to model this town’s population. Use \( P \) for the population \( t \) years from now.

   (b) Find an explicit formula for this town’s population.

4. The population of a town \( t \) years from now is given by \( P \). Suppose that the population of the town is currently 400.

   (a) Determine a mathematical model which best describes this town’s population if it grows at a continuous rate of 8.5% per year.

   (b) Determine a mathematical model which best describes this town’s population if it grows at an annual rate of 8.5% per year.

   (c) Find an explicit formula for \( P \) using each of your models above and use it to predict the population 10 years from now.

5. Suppose that the population of a town is always growing at a rate which is proportional to the population itself. Suppose further that the population is currently 500 and is growing at a rate of 25 people per year. Find a differential equation with initial condition to model the population of this town. Use \( P \) for the population \( t \) years from now.