Logistic Differential Equations

Often population may grow exponentially at first, but eventually slow as it nears a limit, called the **carrying capacity *(L)***. This patter is called logistic growth, and is represented by the differential equation:

$$\frac{dy}{dt} = ky\left(1 - \frac{y}{L}\right)$$

With the General Solution of:

$$y = \frac{L}{1 + be^{-kt}}$$

EX: The population of the Great Britain was 57.1 million in 2001 and 60.6 million in 2006. Find a logistic model for the growth of the population, assuming a carrying capacity of 100 million. Use the model to predict the population in 2020.

EX: The spread of an infectious disease can often be modeled by a logistic equation with the total exposed population as the carrying capacity. In a community of 2000 individuals, the first case of a new virus is diagnosed on March 31, and by April 10, there are 500 individuals infected. Write a differential equation that models the rate at which the virus spread through the community and determine when 98% of the population will have contracted the virus.