# Logistic Differential Equations

I. Answer the following questions for the given logistic differential equations.

1. $\frac{dP}{dt} = \frac{P}{3}(1 - \frac{P}{10})$ 2. $\frac{dP}{dt} = .0015P(150 - P)$ 3. $\frac{dP}{dt} = 0.05P - 0.0005P^2$

a. What is the carrying capacity?

b. What is $k$?

c. For what value of P is the population growing the fastest?

d. If P(0)= 15, $\lim_{t\to\infty} P(t) =$

d. Sketch the graph of the solution of $\frac{dP}{dt}$ with initial value P(0) = 15. Include horizontal asymptotes and inflection points.

II. A certain wild animal preserve can support no more than 250 lowland gorillas. Twenty-eight gorillas were known to be in the preserve in 1970. The population can be modeled with a logistic differential equation with k = 0.1. Let time be measured in years.

a. Find a logistic differential equation to represent the gorillas' population.

b. Sketch a graph of P(t) .

c. Find P(t).

d. How long will it take for the gorilla population to reach the carrying capacity of the preserve? (Hint: P cannot equal the carrying capacity, so use a decimal that will round up to the carrying capacity)