Sample Problem—Calculating Logistic Growth

Example

A population is growing continuously. The carrying capacity of the environment is 1000 individuals and its maximum growth rate, r_{max}, is 0.50.

(a) Determine the population growth rates based on a population size of 20, 200, 500, 900, 990, and 1000.

(b) Describe the relationship between population size and growth rate.

Solution

(a) $\dfrac{dN}{dt} = r_{max} \, N \times \left[\dfrac{(K-N)}{K} \right]$. See **Table 3** for calculated growth rates.

Table 3

r_{max}	Population size N	$\left[\dfrac{(K-N)}{K} \right]$	Population growth rate
0.50	20	$\dfrac{980}{1000}$	9.8
0.50	200	$\dfrac{800}{1000}$	80
0.50	500	$\dfrac{500}{1000}$	125
0.50	900	$\dfrac{100}{1000}$	45
0.50	990	$\dfrac{10}{1000}$	4.95
0.50	1000	0	0

(b) When the population is small the population has a slow rate of growth. It increases as the population increases and then, as it approaches the carrying capacity, the growth rate declines.