

## ► Extending Concepts

**Logistic Growth Rate** In Exercises 21–24, use the information below.

The formula for the logistic growth rate is

$$r = r_0 \times \left( 1 - \frac{\text{population size}}{\text{maximum sustainable population}} \right)$$

where  $r_0$  is the intrinsic growth rate in decimal form.

21. The population of squirrels in a forest is growing logistically. The intrinsic growth rate is 40% per year, and the maximum sustainable population is 5000. Find the rate at which the population is growing when the population reaches (a) 100, (b) 2000, and (c) 4500.
22. The population of raccoons in a forest is growing logistically. The intrinsic growth rate is 50% per year, and the maximum sustainable population is 2000. Find the rate at which the population is growing when the population reaches (a) 200, (b) 1000, and (c) 1800.
23. What is the growth rate when a population is at the maximum sustainable population? Explain.
24. Describe the growth rate when a population exceeds the maximum sustainable population. Explain what this represents in nature.



**Superexponential Growth** In Exercises 25 and 26, use the information below.

A population undergoes *superexponential growth* when the growth rate increases exponentially over time.

25. A population of 100 locusts is introduced to a new area. The initial growth rate is 50% per year. Make a table comparing the population of the locusts over a 10-year period when the growth rate remains constant (exponential) and when the growth rate increases by 20% each year (superexponential). Then make a scatter plot comparing the two data sets.
26. A population of 50 frogs is introduced to a new area. The initial growth rate is 60% per year. Make a table comparing the population of the frogs over a 10-year period when the growth rate remains constant (exponential) and when the growth rate increases by 10% each year (superexponential). Then make a scatter plot comparing the two data sets.



27. **Riddle of the Lily Pad** A single lily pad lies on the surface of a pond. Each day the number of lily pads doubles until the entire pond is covered on day 30. On what day is the pond half-covered?



28. **Mutant Plant** A mutant strain of water plant covers 100 square feet of the surface of a lake. The lake has a surface area of about 1,000,000 square feet. At the end of each day, the surface area covered by the plant is double what it was at the beginning of the day minus the amount of plant cover that you clear. You can clear 5000 square feet of plant cover in 1 day. On what day do you have to begin clearing the plant cover to stop the plant from spreading across the entire lake?