7-8 Skills Practice
Using Exponential and Logarithmic Functions

1. **FISHING** In an over-fished area, the annual catch of a certain fish is decreasing exponentially. Use $k = 0.084$ to determine how long it will take for the catch to reach half of its current amount.

2. **POPULATION** A current census shows that the population of a city is 3.5 million. Using the formula $P = ae^{rt}$, find the expected population of the city in 30 years if the growth rate r of the population is 1.5%, a represents the current population in millions, and t represents the time in years.

3. **POPULATION** The population P in thousands of a city can be modeled by the equation $P = 80e^{0.015t}$, where t is the time in years. In how many years will the population of the city be 120,000?

4. **BACTERIA** How many days will it take a culture of bacteria to increase from 2000 to 50,000? Use $k = 0.657$.

5. **NUCLEAR POWER** The element plutonium-239 is highly radioactive. Nuclear reactors can produce and also use this element. The heat that plutonium-239 emits has helped to power equipment on the moon. If the half-life of plutonium-239 is 24,360 years, what is the value of k for this element?

6. **DEPRECIATION** A Global Positioning Satellite (GPS) system uses satellite information to locate ground position. Abu's surveying firm bought a GPS system for $12,500. The GPS is now worth $8600. How many years ago did Abu buy the GPS system? Use $k = 0.062$ for the annual rate of decay.

7. **LOGISTIC GROWTH** The population of a certain tropical island can be modeled by the function $p(t) = \frac{105,000}{1 + 2.7e^{-0.0981t}}$, where t is the number of years since 1990.

   a. What is the maximum population of this island?

   b. After how many years does the population reach 100,000?