- **9. Biology** A colony of bacteria decays so that the population t days from now is given by $A(t) = 1000 \left(\frac{1}{2}\right)^{t/4}$.
 - **a.** What is the amount present when t = 0?
 - b. How much will be present in 4 days?
 - c. What is the half-life?
- **10.** *Discussion* Can the data below be described as exponential growth?

x	0	1	2	3	4
у	4	4.4	4.8	5.3	5.8



Justify your answer by using a graph, an equation, or a logical argument. Can you think of a situation that the data might describe?

WRITTEN EXERCISES

Evaluate each expression with a calculator.

$$\blacksquare$$
 1. 6^{π} and π^6

2.
$$3.6^{\sqrt{2}}$$
 and $\sqrt{2}^{3.6}$

Find an exponential function having the given values.

3.
$$f(0) = 3$$
, $f(1) = 15$

4.
$$f(0) = 5$$
, $f(3) = 40$

5.
$$f(0) = 64$$
, $f(2) = 4$

6.
$$f(0) = 80, f(4) = 5$$

7. Physics The half-life of a radioactive isotope is 4 days. If 3.2 kg are present now, how much will be present after:

8. Physics The half-life of radium is 1600 years. If 1 kg is present now, how much will be present after:

9. Physics The table shows the amount A(t) in grams of a radioactive element present after t days. Suppose that A(t) decays exponentially.

t(days)	0	2	4	6	8	10
A(t)	320	226	160	115	80	57

- a. What is the half-life of the element?
- **b.** About how much will be present after 16 days?
- c. Find an equation for A(t).

10. Geography The table shows the population P(t) (in thousands) for a small mythical nation at various times.

t (year)	1825	1850	1875	1900	1925	1950	1975
P(t)	200	252	318	401	504	635	800

- a. Does it appear that this population is growing exponentially?
- b. About how long does it take for the population to double?
- c. Find an equation for P(t). (Hint: The exponent contains t-1825.)
- 11. Business The value of a car t years from now is given by $V(t) = 4000(0.85)^t$.
 - a. What is the annual rate of depreciation?
 - b. In how many years will the value of the car be about half what it is now?
- **12. a. Geography** Suppose the population of a nation grows at 3% per year. If the population was 30,000,000 people in 1990, what will be the population, to the nearest million, in the year 2000?
 - **b.** According to the rule of 72, how long does it take for the population to double?
- 13. a. Finance If \$1000 is invested so that it grows at the rate of 10% per year, what will the investment be worth in 20 years?
 - **b.** According to the rule of 72, in approximately how many years will the investment double in value?
- **14. Biology** A bacteria colony triples every 4 days. The population is P_0 bacteria. What will the population P(t) be t days later?
- **15. Consumer Economics** If the price of sneakers increases 6% per year, about how long will it take for the price to double?
- 16. Medicine When a certain medicine enters the blood stream, it gradually dilutes, decreasing exponentially with a half-life of 3 days. The initial amount of the medicine in the blood stream is A_0 milliliters. What will the amount be 30 days later?
- 17. **Medicine** An amount A_0 of radioactive iodine has a half-life of 8.1 days. In terms of A_0 , how much is present after 5 days? (Radioactive iodine is used to evaluate the health of the thyroid gland.)
- **18. a.** Let $f(x) = 2^x$. Complete the table.

х	-2	-1	0	1	2
f(x)	?	?	?	?	?

b. Graph the function by plotting points.

