## CHECK YOUR UNDERSTANDING

Are the statements in Problems 1–32 true or false? Give an explanation for your answer.

1. Exponential functions are functions that increase or decrease at a constant percent rate.
2. The independent variable in an exponential function is always found in the exponent.
3. If $y = 40(1.05)^t$ then $y$ is an exponential function of $t$.
4. The following table shows a function that could be exponential.

| $x$ | 1 | 2 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| $y$ | 1 | 2 | 4 | 7 | 11 |

5. If your salary, $S$, grows by 4% each year, then $S = S_0(0.04)^t$ where $t$ is in years.
6. If $f(t) = 4(2)^t$ then $f(2) = 64$.
7. If $f(t) = 3(\frac{2}{5})^t$ then $f$ is a decreasing function.
8. If $Q = f(t) = 1000(0.5)^t$ then when $Q = 125, t = 3$.
9. If $Q = f(t) = ab^t$ then $a$ is the initial value of $Q$.
10. If we are given two data points, we can find a linear function and an exponential function that go through these points.
11. A population that has 1000 members and decreases at 10% per year can be modeled as $P = 1000(0.10)^t$.
12. A positive increasing exponential function always becomes larger than any increasing linear function in the long run.
13. A possible formula for an exponential function that passes through the point $(0, 1)$ and the point $(2, 10)$ is $y = 4.5t + 1$.
14. If a population increases by 50% each year, then in two years it increases by 100%.
15. In the formula $Q = ab^t$, the value of $a$ tells us where the graph crosses the $Q$-axis.
16. In the formula $Q = ab^t$, if $a > 1$, the graph always rises as we read from left to right.
17. The symbol $e$ represents a constant whose value is approximately 2.71828.
18. If $f(x) \to k$ as $x \to \infty$ we say that the line $y = k$ is a horizontal asymptote.
19. Exponential graphs are always concave up.
20. If there are 110 grams of a substance initially and its decay rate is 3% per minute, then the amount after $t$ minutes is $Q = 110(0.03)^t$ grams.
21. If a population had 200 members at time zero and was growing at 4% per year, then the population size after $t$ years can be expressed as $P = 200(1.04)^t$.
22. If $P = 5e^{0.2t}$, we say the continuous growth rate of the function is 2%.
23. If $P = 4e^{-0.90t}$, we say the continuous growth rate of the function is 10%.
24. If $Q = 3e^{0.2t}$, then when $t = 5$, $Q = 3$.
25. If $Q = Q_0e^{kt}$, with $Q_0$ positive and $k$ negative, then $Q$ is decreasing.
26. If an investment earns 5% compounded monthly, its effective rate will be more than 5%.
27. If a \$500 investment earns 6% per year, compounded quarterly, we can find the balance after three years by evaluating the formula $B = 500(1 + \frac{6}{4})^{3\cdot4}$.
28. If interest on a \$2000 investment is compounded continuously at 3% per year, the balance after five years is found by evaluating the formula $B = 2000e^{(0.03)(5)}$.
29. Investing \$10,000 for 20 years at 5% earns more if interest is compounded quarterly than if it is compounded annually.
30. Investing \$$P$ for $T$ years always earns more if interest is compounded continuously than if it is compounded annually.
31. There is no limit to the amount a twenty-year \$10,000 investment at 5% interest can earn if the number of times the interest is compounded becomes greater and greater.
32. If you put \$1000 into an account that earns 5.5% compounded continuously, then it takes about 18 years for the investment to grow to \$2000.