

EXPONENTIAL MODELS

Do you know HOW?

Without graphing, determine whether the function represents exponential growth or exponential decay.

Then find the y -intercept.

1. $y = 10(0.45)^x$ 2. $y = 0.75(4)^x$

3. $y = 3^x$ 4. $y = 0.95^x$

5. $A(t) = 3(1.04)^t$ 6. $A(t) = 7(0.6)^t$

Do you UNDERSTAND?

7. **Vocabulary** Explain how you can tell if $y = ab^x$ represents exponential growth or exponential decay.

8. **Reasoning** Identify each function as *linear*, *quadratic*, or *exponential*. Explain your reasoning.

a. $y = 3(x + 1)^2$

b. $y = 4(3)^x$

c. $y = 2x + 5$

d. $y = 4(0.2)^x + 1$

9. **Error Analysis** A classmate says that the growth factor of the exponential function $y = 15(0.3)^x$ is 0.3. What is the student's mistake?



Practice and Problem-Solving Exercises



Practice Graph each function.

◀ See Problem 1.

10. $y = 6^x$

11. $y = 3(10)^x$

12. $y = 1000(2)^x$

13. $y = 9(3)^x$

14. $f(x) = 2(3)^x$

15. $s(t) = 1.5^t$

16. $y = 8(5)^x$

17. $y = 2^{2x}$

Without graphing, determine whether the function represents exponential growth or exponential decay. Then find the y -intercept.

◀ See Problem 2.

18. $y = 129(1.63)^x$

19. $f(x) = 2(0.65)^x$

20. $y = 12\left(\frac{17}{10}\right)^x$

21. $y = 0.8\left(\frac{1}{8}\right)^x$

22. $f(x) = 4\left(\frac{5}{6}\right)^x$

23. $y = 0.45(3)^x$

24. $y = \frac{1}{100}\left(\frac{4}{3}\right)^x$

25. $f(x) = 2^{-x}$

26. **Interest** Suppose you deposit \$2000 in a savings account that pays interest at an annual rate of 4%. If no money is added or withdrawn from the account, answer the following questions.

◀ See Problems 3 and 4.

- How much will be in the account after 3 years?
- How much will be in the account after 18 years?
- How many years will it take for the account to contain \$2500?
- How many years will it take for the account to contain \$3000?

Write an exponential function to model each situation. Find each amount after the specified time.

◀ See Problem 5.

- A population of 120,000 grows 1.2% per year for 15 years.
- A population of 1,860,000 decreases 1.5% each year for 12 years.
- a. Sports** Before a basketball game, a referee noticed that the ball seemed under-inflated. She dropped it from 6 feet and measured the first bounce as 36 inches and the second bounce as 18 inches. Write an exponential function to model the height of the ball.
b. How high was the ball on its fifth bounce?

30. **Think About a Plan** Your friend invested \$1000 in an account that pays 6% annual interest. How much interest will your friend have after her college graduation in 4 years?

- Is an exponential model reasonable for this situation?
- What equation should you use to model this situation?
- Is the solution of the equation the final answer to the problem?