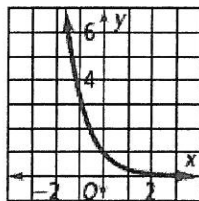


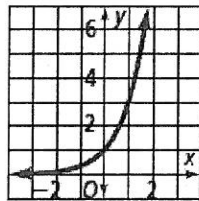
Exploring Exponential Models

Graph each function.

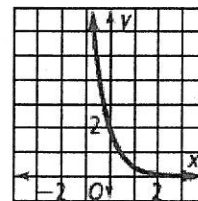
1. $y = (0.3)^x$



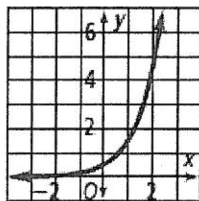
2. $y = 3^x$



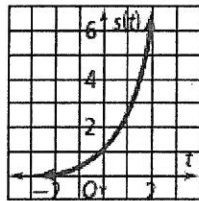
3. $y = 2\left(\frac{1}{5}\right)^x$



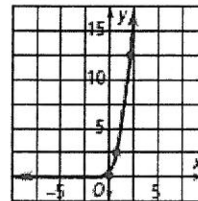
4. $y = \frac{1}{2}(3)^x$



5. $s(t) = 2.5^t$



6. $f(x) = \frac{1}{2}(5)^x$



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

7. $y = 0.99\left(\frac{1}{3}\right)^x$ decay; 0.99

8. $y = 20(1.75)^x$ growth; 20

9. $y = 185\left(\frac{5}{4}\right)^x$ growth; 185

10. $f(x) = \frac{2}{3}\left(\frac{1}{2}\right)^x$ decay; $\frac{2}{3}$

11. $f(x) = 0.25(1.05)^x$ growth; 0.25

12. $y = \frac{1}{5}\left(\frac{6}{5}\right)^x$ growth; $\frac{1}{5}$

13. Suppose you deposit \$1500 in a savings account that pays interest at an annual rate of 6%. No money is added or withdrawn from the account.

a. How much will be in the account after 5 years? about \$2007.34

b. How much will be in the account after 20 years? \$4810.70

~~c. How many years will it take for the account to contain \$2500? about 9 years~~

~~d. How many years will it take for the account to contain \$4000? about 17 years~~

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

14. A population of 1,236,000 grows 1.3% per year for 10 years.

$$y = 1,236,000(1.013)^x; \text{ about } 1,406,413$$

15. A population of 752,000 decreases 1.4% per year for 18 years.

$$y = 752,000(0.986)^x; \text{ about } 583,448$$

16. A new car that sells for \$18,000 depreciates 25% each year for 4 years.

$$y = 18,000(0.75)^x; \text{ } \$5695.31$$

For each annual rate of change, find the corresponding growth or decay factor.

17. +45% 1.45 18. -10% 0.9 19. -40% 0.6 20. +200% 3
21. +28% 1.28 22. +100% 2 23. -5% 0.95 24. +3% 1.03

25. In 2009, there were 1570 bears in a wildlife refuge. In 2010, the population had increased to approximately 1884 bears. If this trend continues and the bear population is increasing exponentially, how many bears will there be in 2018?

8100 bears

26. The value of a piece of equipment has a decay factor of 0.80 per year. After 5 years, the equipment is worth \$98,304. What was the original value of the equipment? \$300,000

27. Your friend drops a rubber ball from 4 ft. You notice that its rebound is 32.5 in. on the first bounce and 22 in. on the second bounce.

- a. What exponential function would be a good model for the height of the ball? $y = 48(0.677)^x$
b. How high will the ball bounce on the fourth bounce? about 10.08 in.

28. An investment of \$75,000 increases at a rate of 12.5% per year. What is the value of the investment after 30 years? \$2,568,247.87

29. A new truck that sells for \$29,000 depreciates 12% each year. What is the value of the truck after 7 years? \$11,851.59

30. The price of a new home is \$350,000. The value of the home appreciates 2% each year. How much will the home be worth in 10 years? \$426,648.05

31. The population of an endangered bird is decreasing at a rate of 0.75% per year. There are currently about 200,000 of these birds.

- a. What exponential function would be a good model for the population of these endangered birds? $y = 200,000(0.9925)^x$
b. How many birds will there be in 100 years? almost 94,207 birds

7A

~~7A~~ - Exponential Growth and Decay Functions - Homework

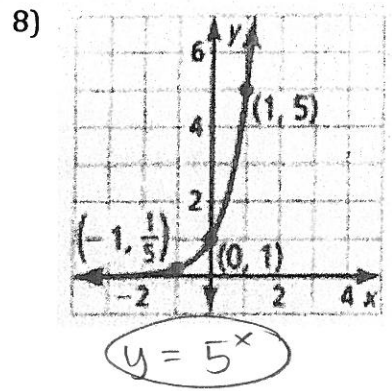
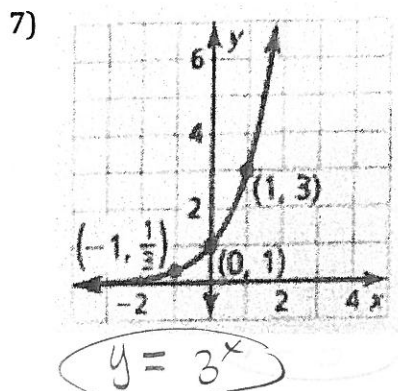
Evaluate each expression for (a) $x = -2$ and (b) $x = 3$.

- 1) 2^x a) $(\frac{1}{4})$ b) (8) 2) $8 \cdot 3^x$ a) $(\frac{8}{9})$ b) (216) 3) $5 + 4^x$ a) $(\frac{81}{16})$ b) (69)

Tell whether the function represents *exponential growth* or *exponential decay*.

- 4) $y = (\frac{4}{3})^x$ growth 5) $y = (1.2)^x$ growth 6) $y = (\frac{2}{5})^x$ decay

~~Use the graph of the exponential function below to write the function.~~ write the function.



9) The value of a mountain bike y (in dollars) can be approximated by the model $y = 200(0.75)^t$, where t is the number of years since the bike was new.

- a. Tell whether the model represents exponential growth or exponential decay. decay
- b. Identify the annual percent increase or decrease in the value of the bike. 25% decrease
- c. Estimate when the value of the bike will be \$50.
guess & check 4.5 years?

10) You take a 325 milligram dosage of ibuprofen. During each subsequent hour, the amount of medication in your bloodstream decreases by about 29% each hour.

- a. Write an exponential model giving the amount y (in milligrams) of ibuprofen in your bloodstream t hours after the initial dose. $y = 325(0.71)^x$
- ~~b. Estimate how long it takes for you to have 100 milligrams of ibuprofen in your bloodstream.~~ 3.5 hours?
- ~~c. Write an interval that represents the domain of the function.~~ $0 < x < 24$

11) When a plant or animal dies, it stops acquiring carbon-14 from the atmosphere. The amount y (in grams) of carbon-14 in the body of an organism after t years is $y = a(0.5)^{t/5730}$, where a is the initial amount (in grams). What percent of the carbon-14 is released each year? 50%

12) A website recorded the number y of referrals it received from social media websites over a 10-year period. The results can be modeled by $y = 2500(1.50)^t$, where t is the year and $0 \leq t \leq 9$. Interpret the values of a and b in this situation. What is the annual percent increase? 50%

13) The population p of a small town after x years can be modeled by the function $p = 6850(1.03)^x$. What is the average rate of change in the population over the first 6 years?

$$\begin{array}{l} 0, 6850 \\ 6, 8179.25 \end{array} \quad \Delta y \quad \begin{array}{l} \text{by } 1329.26 \\ \Delta x \quad 6 \end{array} = \text{221.5 ppl per year}$$