

## 4.2.1: Exponential Growth and Decay Models (Exercises)

### SECTION 4.2 PROBLEM SET: EXPONENTIAL GROWTH AND DECAY FUNCTIONS

Identify each as an exponential, linear, or power function.

1. $y = 640(1.25^x)$	2. $y = 640(x^{1.25})$
3. $y = 640(1.25x)$	4. $y = 1.05x - 2.5$
5. $y = 90 - (4/5)x$	6. $y = 42(0.92^x)$
7. $y = 37(x^{0.25})$	8. $y = 4(1/3)^x$

Indicate if the function represents exponential growth or exponential decay.

9. $y = 127e^{-0.35t}$	10. $y = 70(0.8^t)$
11. $y = 453(1.2^t)$	12. $y = 16e^{0.2t}$

In each of the following,  $y$  is an exponential function of  $t$  stated in the form  $y = ae^{kt}$  where  $t$  represents time measured in years.. For each:

- re-express each function in the form  $y = ab^t$  (state the value of  $b$  accurate to 4 decimal places)
- state the annual growth rate or annual decay rate as a percent, accurate to 2 decimal places

13. $y = 127e^{-0.35t}$	14. $y = 16e^{0.4t}$
15. $y = 17250e^{0.24t}$	16. $y = 4700e^{-0.07t}$

Identify if the function represents exponential growth, exponential decay, linear growth, or linear decay. In each case write the function and find the value at the indicated time.

17. A house was purchased for \$350,000 in the year 2010. The value has been increasing by \$7,000 per year. Write the function and find the value of the house after 5 years.	18. A house was purchased for \$350,000 in the year 2010. The value has been increasing at the rate of 2% per year. Write the function and find the value of the house after 5 years.
19. A lab purchases new equipment for \$50,000. Its value depreciates over time. The value decreases at the rate of 6% annually. Write the function and find the value after 10 years.	20. A lab purchases new equipment for \$50,000. Its value depreciates over time. The value decreases by \$3000 annually. Write the function and find the value after 10 years
21. A population of bats in a cave has 200 bats. The population is increasing by 10 bats annually. Write the function. How many bats live in the cave after 7 years?	22. A population of bats in a cave has 200 bats. The population is increasing at the rate of 5% annually. Write the function. How many bats live in the cave after 7 years?
23. A population of a certain species of bird in a state park has 300 birds. The population is decreasing at the rate of 7% year. Write the function. How many birds are in the population after 6 years?	24. A population of a certain species of bird in a state park has 300 birds. The population decreases by 20 birds per year. Write the function. How many birds are in the population after 6 years?

In problems 25-28, the problem represents exponential growth or decay and states the CONTINUOUS growth rate or continuous decay rate. Write the exponential growth or decay function and find the value at the indicated time.

*Hint: Use the form of the exponential function that is appropriate when the CONTINUOUS growth or decay rate is given.*

25. A population of 400 microbes increases at the **continuous** growth rate of 26% per day. Write the function and find the number of microbes in the population at the end of 7 days.

27. A population of an endangered species consists of 4000 animals of that species. The population is decreasing at the continuous rate of 12% per year. Write the function and find the size of the population at the end of 10 years.

26. The price of a machine needed by a production factory is \$28,000. The business expects to replace the machine in 4 years. Due to inflation the price of the machine is increasing at the **continuous** rate of 3.5% per year. Write the function and find the value of the machine 4 years from now.

28. A business buys a computer system for \$12000. The value of the system is depreciating and decreases at the continuous rate of 20% per year. Write the function and find the value at the end of 3 years.

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