

6-3

Exponential
Growth and
Decay**EXPLORE & REASON**

Cindy is buying a new car and wants to learn how the value of her car will change over time. Insurance actuaries predict the future value of cars using depreciation functions. One such function is applied to the car whose declining value is shown.

- A. Describe how the value of the car decreases from year to year.

Years After Purchase	Value
0 yr	\$10,000
1 yr	\$8,520
2 yr	\$7,213
3 yr	\$6,100
4 yr	\$5,210

- B. **Model With Mathematics** What kind of function would explain this type of pattern?
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- C. Given your answer to Part B, what is needed to find the function the actuary is using? Explain.

HABITS OF MIND

Make Sense and Persevere What is the constant ratio for the declining values? © MP.1

**EXAMPLE 4**  **Try It! Exponential Models of Decay**

4. How would the average rate of change over the same intervals be affected if the population increased at a rate of 8%?


EXAMPLE 5  **Try It! Exponential Growth and Decay**

5. Explain how to use tables on a graphing calculator to answer this question.

HABITS OF MIND

Model With Mathematics What are the key differences in the algebraic representations of exponential growth and decay? Explain. © MP.4

Do You UNDERSTAND?

-  **ESSENTIAL QUESTION** What kinds of situations can be modeled with exponential growth or exponential decay?
- Vocabulary** What is the difference between simple interest and *compound interest*?
- Error Analysis** LaTanya says that the growth factor of $f(x) = 100(1.25)^x$ is 25%. What mistake did LaTanya make? Explain. © MP.3
- Look for Relationships** Why is the growth factor $1 + r$ for an exponential growth function? © MP.7

Do You KNOW HOW?

Write an exponential growth or decay function for each situation.

- initial value of 100 increasing at a rate of 5%
- initial value of 1,250 increasing at a rate of 25%
- initial value of 512 decreasing at a rate of 50%
- initial value of 10,000 decreasing at a rate of 12%
- What is the difference in the value after 10 years of an initial investment of \$2,000 at 5% annual interest when the interest is compounded quarterly rather than annually?