## LESSON Reading Strategy

## **Drawing Conclusions**

In an exponential function, the variable appears as an exponent:  $f(x) = ab^x$ , where *a* is a constant and *b* is the base. Depending on the value of *b*, the function either increases (grows) or decreases (decays). You can draw conclusions about the function and its graph based on the value of *b*.



1. Complete the table.

X	-2	-1	0	1	2	3
$f(x) = 3^x$	<u>1</u> 9					
$f(x) = 0.4^x$						

## Use the function $f(x) = 3^x$ for Exercises 2 and 3.

- **2.** Does the function  $f(x) = 3^x$  show exponential growth or decay? Explain.
- **3.** Is f(4) greater than or less than f(3)? Explain how you can draw this conclusion.

## Use the function $f(x) = 0.4^{x}$ for Exercises 4 and 5.

- **4.** Does the function  $f(x) = 0.4^x$  show exponential growth or decay? Explain.
- **5.** Is f(-3) greater than or less than f(-2)? Explain how you can draw this conclusion.

Reteach			
<b>74</b> Exponential Functions, Growth, and Decay (continued)	TAI The Vizier and His Wheat		
When an initial amount, a, increases or decreases by a constant rate, r, over a number of time	According to legend, Sissa Ben Dahir, the Vizier of the court of King Shirham of India, worked diligently and invented a new game that was		
periods, <i>t</i> , this formula shows the final amount, <i>A</i> ( <i>t</i> ).	called Chess. The King decided to grant Sissa the reward of his choosing.		
$A(t) = a(1 + n)^{t}$ Time, t, is measured in years.	One grain of wheat on the first square of the chessboard.		
amount, is a function The rate, <i>r</i> , usually is a percent.	two grains of wheat on the second square, four grains on		
a is the initial amount.	The King thought this was a very modest request and		
An initial amount of \$15,000 increases by 12% per year. In how many years will the amount	said that he would grant the Vizier's request.		
reach \$25,000?	At right is a chessboard with 64 squares.		
Step 1 Identify values for a and r. a = \$15,000 $r = 10% = 0.12$ Remember: On the graph view	1. Make a table showing the		
<b>Step 2</b> Substitute values for <i>a</i> and <i>r</i> into the formula.	number of grains of wheat Square n Grains of Wheat on Total Grains of Wheat on Board		
$f(t) = a(1 + r)^{t}$ corresponds to $f(t)$ .	the total grains of wheat on 1 1 1		
$f(t) = 15,000(1 + 0.12)^t$	squares 1 through <i>n</i> , for $2$ $2$ $3$ n = 1, 2, 3,, 10. $3$ $4$ $7$		
$f(t) = 15,000(1.12)^t$ Simplify.	4 8 15		
Step 3 Graph the function using a graphing calculator. Modify the scales: [0, 10] and [0, 30,000].	5 <u>16</u> <u>31</u> 6 <u>32</u> <u>63</u>		
Step 4 Use the graph and the [TRACE] feature	7 64 127		
on the calculator to find $f(t) = 25,000$ .	8 128 255		
when $f(t) = 25,000$ .	10 512 1023		
t = 4.5 when $f(t) = 25,000$	2. Using the information from the table, look for a		
The amount will reach \$25,000 in about 4.5 years.	grains of wheat that would be placed on square <i>n</i> . $2^{n-1}$		
Write an exponential function and graph the function to solve.	<b>3.</b> How many grains of wheat would be placed on $2^{63} = 9,223,372,036,$		
3. An initial amount of \$40,000 increases by 8% per year. In how many years	the last square?		
will the annount reach \$00,000?	number of grains of wheat on the board after wheat $2^n - 1$		
<b>a.</b> $a = \frac{40,000}{0.08}$	has been placed on square <i>n</i> . <b>5</b> What is the total number of grains of wheat that $2^{64} - 1 = 18,446$ .		
b. $r = 0.00$ $f(t) = 40.000(1.08)^{t}$	5. What is the total humber of grains of wheat that 744,073,709,551,615		
<b>c.</b> $R(t) = \frac{1}{10000000000000000000000000000000000$	6. One grain of wheat weighs approximately 0.000008 kilogram.		
t ≈ <u>5.25 yr</u> 20.000	7. In 2000 the world's wheat production was approximately		
10,000	580 million metric tons. At this rate how many years would it take to fill Sisca's request? One metric ton is 1000 kilograms 254.4 years		
0 1 2 3 4 5 6 7 8 9 10			
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LESSON Problem Solving	Reading Strategy		
Problem Solving           741         Exponential Functions, Growth, and Decay	Reading Strategy           74         Drawing Conclusions		
Esson         Problem Solving           Exponential Functions, Growth, and Decay           Justin drove his pickup truck about 22,000 miles in 2004. He read that           in 1988 the average residential vehicle traveled about 10,200 miles,	<b>Reading Strategy</b> <b>Drawing Conclusions</b> In an exponential function, the variable appears as an exponent: $f(x) = ab^x$ , where $a_i = a_i$ constant and $b_i$ is the base. Depending on the value of $b_i$ the		
Essent         Problem Solving           Exponential Functions, Growth, and Decay         Justin drove his pickup truck about 22,000 miles in 2004. He read that in 1988 the average residential vehicle traveled about 10,200 miles, which increased by about 2.9% per year through 1994.	<b>Reading Strategy</b> <b>Drawing Conclusions</b> In an exponential function, the variable appears as an exponent: $f(x) = ab^x$ , where <i>a</i> is a constant and <i>b</i> is the base. Depending on the value of <i>b</i> , the function either increases (grows) or decreases (decays). You can draw		
Problem Solving         241       Exponential Functions, Growth, and Decay         Justin drove his pickup truck about 22,000 miles in 2004. He read that in 1988 the average residential vehicle traveled about 10,200 miles, which increased by about 2.9% per year through 1994.         1. Write a function for the average mileage, $m(t)$ , as a function of $t$ , the time in years since 1988. $m(t) = 10,200(1 + 0.029)^t$	<b>Reading Strategy</b> <b>Drawing Conclusions</b> In an exponential function, the variable appears as an exponent: $f(x) = ab^x$ , where <i>a</i> is a constant and <i>b</i> is the base. Depending on the value of <i>b</i> , the function either increases (grows) or decreases (decays). You can draw conclusions about the function and its graph based on the value of <i>b</i> .		
Problem Solving         21       Exponential Functions, Growth, and Decay         Justin drove his pickup truck about 22,000 miles in 2004. He read that         in 1988 the average residential vehicle traveled about 10,200 miles,         which increased by about 2.9% per year through 1994.         1. Write a function for the average mileage, $m(t)$ , as         a function of t, the time in years since 1988.         2. Assume that the 2.9% increase is valid through 2008 and use your function	Image: Tessor interview         Reading Strategy           Tessor interview         Drawing Conclusions           In an exponential function, the variable appears as an exponent: $f(x) = ab^x$ , where $a$ is a constant and $b$ is the base. Depending on the value of $b$ , the function either increases (grows) or decreases (decays). You can draw conclusions about the function and its graph based on the value of $b$ .           Exponential Growth         Exponential Decay		
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Existent       Problem Solving <b>Exponential Functions, Growth, and Decay</b> Justin drove his pickup truck about 22,000 miles in 2004. He read that         in 1988 the average residential vehicle traveled about 10,200 miles,         which increased by about 2.9% per year through 1994.         1. Write a function of the average mileage, $m(t)$ , as a function of t, the time in years since 1988.         2. Assume that the 2.9% increase is valid through 2008 and use your function to complete the table to show the average annual miles driven.         Year       1988       1992       1996       2000       2004       2008         t       0       4       8       12       16       20	Essent       Reading Strategy         Drawing Conclusions         In an exponential function, the variable appears as an exponent: $f(x) = ab^x$ , where $a$ is a constant and $b$ is the base. Depending on the value of $b$ , the function either increases (grows) or decreases (decays). You can draw conclusions about the function and its graph based on the value of $b$ .         Exponential Growth       Exponential function shows growth if $a > 0$ and $b > 1$ . $a^{b^2}$ $a^{b^2}$ $a^{b^2}$ $a^{b^2}$		
Problem SolvingExponential Functions, Growth, and DecayJustin drove his pickup truck about 22,000 miles in 2004. He read thatin 1988 the average residential vehicle traveled about 10,200 miles, which increased by about 2.9% per year through 1994.1. Write a function for the average mileage, $m(t)$ , as a function of $t$ , the time in years since 1988. $m(t) = 10,200(1 + 0.029)^t$ 2. Assume that the 2.9% increase is valid through 2008 and use your function to complete the table to show the average annual miles driven.Year 1988 1992 1996 2000 2004 2008 t 0 4 8 12 16 20 $m(t) 10,200 11,436 12,821 14,374 16,116 18,068$	<b>Reading Strategy</b> Drawing Conclusions         In an exponential function, the variable appears as an exponent: $f(x) = ab^x$ , where $a$ is a constant and $b$ is the base. Depending on the value of $b$ , the function either increases (grows) or decreases (decays). You can draw conclusions about the function and its graph based on the value of $b$ .         Exponential Growth if $a > 0$ and $b > 1$ .       Exponential function shows growth if $a > 0$ and $b > 1$ . $a = \frac{a^y}{a}$ $a = \frac{a^y}{a}$ $a = \frac{a^y}{a}$ $a = 0$ $a = 0$ $a = 0 = 0$ $a = \frac{a^y}{a}$ $a = \frac{a^y}{a}$ $a = \frac{a^y}{a}$ $a = \frac{a^y}{a}$		
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<b>Problem Solving</b> <b>EXAMPLE 1 Exponential Functions, Growth, and Decay</b> Justin drove his pickup truck about 22,000 miles in 2004. He read that in 1988 the average residential vehicle traveled about 10,200 miles, which increased by about 2.% per year through 1994. 1. Write a function for the average mileage, $m(t)$ , as a function of t, the time in years since 1988. $m(t) = 10,200(1 + 0.029)^t$ 2. Assume that the 2.9% increase is valid through 2008 and use your function to complete the table to show the average annual miles driven. $\overline{t \ 0 \ 4 \ 8 \ 12 \ 16 \ 20}$ $m(t) \ 10.200 \ 11,436 \ 12,821 \ 14,374 \ 16,116 \ 18,068$ 3. Did Justin drive more or fewer miles than the average residential vehicle driver in 2004? by how much (to the nearest 100 miles)? He drove more miles: About 5.900 miles more.	<b>EXAMPLANCE INTEGRATE BASES OF CONTRACT O</b>		
Problem Solving         241       Exponential Functions, Growth, and Decay         Justin drove his pickup truck about 22,000 miles in 2004. He read that in 1988 the average residential vehicle traveled about 10,200 miles, which increased by about 2.9% per year through 1994.         1. Write a function for the average mileage, $m(t)$ , as a function of t, the time in years since 1988. $m(t) = 10,200(1 + 0.029)^t$ 2. Assume that the 2.9% increase is valid through 2008 and use your function to complete the table to show the average annual miles driven. $verat = 1988 = 1992 = 1996 = 2000 = 2004 = 2008 \\ t = 0 = 4 = 8 = 12 = 16 = 20 \\ m(t) = 10,200 = 11,436 = 12,821 = 14,374 = 16,116 = 18,068 \\ 10,200 = 11,436 = 12,821 = 14,374 = 16,116 = 18,068 \\ 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10,200 = 10$	<b>EXAMPLANCE TO A Strategy</b> <b>Drawing Conclusions</b> In an exponential function, the variable appears as an exponent: $f(x) = ab^x$ , where <i>a</i> is a constant and <i>b</i> is the base. Depending on the value of <i>b</i> , the function either increases (grows) or decreases (decays). You can draw conclusions about the function and its graph based on the value of <i>b</i> . <b>Exponential Growth</b> An exponential function shows growth if $a > 0$ and $b > 1$ . <b>Exponential function</b> the value of $b = 1$		
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Problem Solving         Mathematical Solving         Solving         Justin drove his pickup truck about 22,000 miles in 2004. He read that in 1988 the average residential vehicle traveled about 10,200 miles, which increased by about 2.9% per year through 1994.         1. Write a function for the average mileage, $m(t)$ , as $m(t) = 10,200(1 + 0.029)^t$ 2. Assume that the 2.9% increase is valid through 2008 and use your function to complete the table to show the average annual miles driven. $\overline{vear}$ 1988       1992       1996       2000       2004       2008 $t$ 0       4       8       12       16       20 $m(t)$ 10,200       11,436       12,821       14,374       16,116       18,068         Out 2004 2008 $t$ 10       0.200       11,436       12,821       14,374       16,116       18,068         Out 2004 2008 $t$ 10,200       11,436       12,821       14,374       16,116       18,068         Out 2004 2008         Met drove more or flewer miles than the average residential vehicle driver in 2004? by how much (to the nearest 100 miles)?         He drove more miles; about 5,900 miles more.       10 <td col<="" th=""><th><b>Reading Strategy</b> <b>Drawing Conclusions</b> In an exponential function, the variable appears as an exponent: <math>f(x) = ab^x</math>, where <i>a</i> is a constant and <i>b</i> is the base. 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Problem Solving         Mathematical Exponential Functions, Growth, and Decay         Justin drove his pickup truck about 22,000 miles in 2004. He read that in 1988 the average residential vehicle traveled about 10,200 miles, which increased by about 2.9% per year through 1994.         1. Write a function for the average mileage, $m(t)$ , as a function of t, the time in years since 1988. $m(t) = 10,200(1 + 0.029)^t$ A ssume that the 2.9% increase is valid through 2008 and use your function to complete the table to show the average annual miles driven.         Year 100 4 2004 2004 2008 at use your function to complete the table to show the average annual miles driven.         Year 100 4 2000 2004 2008 at use your function to complete the table to show the average annual miles driven.         Year 100 4 8 12 16 20 100 11,436 12,821 14,374 16,116 18,068         Outsin drive more or fewer miles than the average residential vehicle driver in 2004? by how much (to the nearest 100 miles)?         He drove more miles; about 5,900 miles more.         4. Later Justin read that the annual mileage for light trucks increased by 7.8% per year from 1988 to 1994.         Nrite a function for the average miles driven for a light truck, n(t), as a function of t, the time in years since 1988. He assumes that the average mumber of miles driven in 1988 was 10.200.         n(t) = 10,200(1 + 0.078) <sup>t</sup>	<b>EXAMPLE 1</b> <b>Reading Strategy</b> <b>Drawing Conclusions</b> In an exponential function, the variable appears as an exponent: $f(x) = ab^x$ , where <i>a</i> is a constant and <i>b</i> is the base. Depending on the value of <i>b</i> , the function either increases (grows) or decreases (decays). You can draw conclusions about the function and its graph based on the value of <i>b</i> . <b>Exponential Growth</b> An exponential function shows growth if $a > 0$ and $b > 1$ . <b>Exponential function</b> shows growth if $a > 0$ and $b > 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $b > 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $b < 0$ . <b>Exponential function</b> shows decay if $a > 0$ and $b < 0$ . <b>Exponential function</b> shows decay if $a > 0$ and $b < 0$ . <b>Exponential function</b> shows decay if $a > 0$ and $b < 0$ . <b>Exponential function</b> shows decay if $a > 0$ and $b < 0$ . <b>Exponential function</b> shows decay if $a > 0$ and $b < 0$ . <b>Exponential function</b> shows decay if $a > 0$ and $b < 0$ . <b>Exponential function</b> shows decay if $a > 0$ and $b < 0$ . <b>Exponential function</b> shows decay if $a > 0$ and $b < 0$ . <b>Exponential function</b> shows decay if $a > 0$ and $b < 0$ . <b>Exponential function</b> shows decay if $a > 0$ and $b < 0$ . <b>Exponential function</b> shows decay if $a > 0$ and $b < 0$ . <b>Exponential function</b> shows decay if $a > 0$ and $b < 0$ . <b>Exponential function</b> shows decay if $a > 0$ and $b < 0$ . <b>Exponential function</b> shows decay if $a > 0$ and $b < 0$ . <b>Exponential function</b> shows decay if $a > 0$ and $b < 0$ . <b>Exponential function</b> shows decay if $a > 0$ . <b>Exponential function</b> sh		
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Problem Solving         Example Submetrial Functions, Growth, and Decay         Justin drove his pickup truck about 22,000 miles in 2004. He read that         in 1988 the average residential vehicle traveled about 10,200 miles,         which increased by about 2.9% per year through 1994.         1. Write a function of the average mileage, $m(t)$ , as         a function of t, the time in years since 1988.         2. Assume that the 2.9% increase is valid through 2008 and use your function         to complete the table to show the average annual miles driven.         Year       1988         10.200       11,436         12.82       16         20.01       1,436         12.82       14,374         16.16       18,068         2. Did Justin drive more or fewer miles than the average residential vehicle driver in 2004? by how much (to the nearest 100 miles)?         He drove more miles; about 5,900 miles more.         4. Later Justin read that the annual mileage for light trucks increased by 7.8% per year from 1988 to 1994.         a. Write a function for the average miles driven for a light truck, n(t), as a function of t, the time in years since 1988. He assumes that the average number of miles driven in 1998 was 10,200.         b. Graph the function. Then use your graph to estimate the average number of miles driven in 1988 was 10,200.         to the nearest 10000) for a light truck in 2000 (f + 0.078) t <t< th=""><th><b>Reading Strategy</b> <b>Drawing Conclusions</b> In an exponential function, the variable appears as an exponent: <math>f(x) = ab^x</math>, where <i>a</i> is a constant and <i>b</i> is the base. Depending on the value of <i>b</i>, the function either increases (grows) or decreases (decays). 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Problem Solving         Mathematical Exponential Functions, Growth, and Decay         Justin drove his pickup truck about 22,000 miles in 2004. He read that in 1988 the average residential vehicle traveled about 10,200 miles, which increased by about 2.9% per year through 1994.	<b>Reading Strategy</b> <b>Drawing Conclusions</b> In an exponential function, the variable appears as an exponent: $f(x) = ab^x$ , where <i>a</i> is a constant and <i>b</i> is the base. Depending on the value of <i>b</i> , the function either increases (grows) or decreases (decays). You can draw conclusions about the function and its graph based on the value of <i>b</i> . <b>Exponential Growth</b> An exponential function shows growth if $a > 0$ and $b > 1$ . <b>Exponential function</b> shows growth if $a > 0$ and $b > 1$ . <b>Exponential function</b> shows growth if $a > 0$ and $b > 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows $decay$ if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows $decay$ if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows $decay$ if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows $decay$ if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows $decay$ if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows $decay$ if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows $decay$ if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows $decay$ if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows $decay$ if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows $decay$ if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows $decay$ if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows $decay$ if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows $decay$ if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows $decay$ if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows $decay$ if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows $decay$ if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows $decay$ if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows $decay$ if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows $decay$ if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows $decay$ if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows $decay$ if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows $decay$ if $a $		
Problem Solving         Mathematical Exponential Functions, Growth, and Decay         Justin drove his pickup truck about 22,000 miles in 2004. He read that in 1988 the average residential vehicle traveled about 10,200 miles, which increased by about 2.9% per year through 1994.         1. Write a function for the average mileage, $m(t)$ , as a function of t, the time in years since 1988.         2. Assume that the 2.9% increase is valid through 2008 and use your function to complete the table to show the average annual miles driven.            Year 1988 1992 1996 2000 2004 2008 $\frac{1}{2000}$ $\frac{1}{10,200(1 + 0.029)^t}$ 3. Assume that the 2.9% increase is valid through 2008 and use your function to complete the table to show the average annual miles driven.            Year 1988 1992 1996 2000 2004 2008 $\frac{1}{200}$ $\frac{1}{0,10,200(1 + 0.029)^t}$ 3. Old Justin drive more or fewer miles than the average residential vehicle driver in 2004? by how much (to the nearest 1000 miles)?             He drove more miles; about 5,900 miles more.             Anout 34,000 miles             Cold Justin drive more or fewer miles than the average miles driven for a light truck, n(t), as a function of t, the time in years since 1988. He assumes that the average number of miles driven in 1988 was 10,200.             Anout 34,000 miles             Cold Justin drive more or fewer miles than the average light truck driver in 2004? by how	<b>EXAMPLE 1</b> <b>Reading Strategy</b> <b>Drawing Conclusions</b> In an exponential function, the variable appears as an exponent: $f(x) = ab^x$ , where <i>a</i> is a constant and <i>b</i> is the base. Depending on the value of <i>b</i> , the function either increases (grows) or decreases (decays). You can draw conclusions about the function and its graph based on the value of <i>b</i> . <b>Exponential Growth</b> An exponential function shows growth if $a > 0$ and $b > 1$ . <b>Exponential function</b> shows growth if $a > 0$ and $b > 1$ . <b>Exponential function</b> shows growth if $a > 0$ and $b > 1$ . <b>Exponential function</b> shows growth if $a > 0$ and $b > 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> f(x) = 3 <sup>x</sup> for Exercises 2 and 3. 2. Does the function $f(x) = 3^x$ show exponential growth or decay? Explain. Growth: because base <i>b</i> is grapter than 1		
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<b>Problem Solving</b> <b>Problem Solving</b> <b>Problem Solving</b> <b>Sumary Series 1 </b>	<b>Reading Strategy</b> <b>Drawing Conclusions</b> In an exponential function, the variable appears as an exponent: $f(x) = ab^x$ , where <i>a</i> is a constant and <i>b</i> is the base. Depending on the value of <i>b</i> , the function either increases (grows) or decreases (decays). You can draw conclusions about the function and its graph based on the value of <i>b</i> . <b>Exponential Growth</b> An exponential function shows growth if $a > 0$ and $b > 1$ . <b>Exponential function</b> shows growth if $a > 0$ and $b > 1$ . <b>Exponential function</b> shows growth if $a > 0$ and $b > 1$ . <b>Exponential function</b> shows growth if $a > 0$ and $b > 1$ . <b>Exponential function</b> shows growth if $a > 0$ and $b > 1$ . <b>Exponential function</b> shows growth if $a > 0$ and $b > 1$ . <b>Exponential function</b> shows growth if $a > 0$ and $b > 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> f(x) = $3^x$ for Exercises 2 and 3. 2. Does the function $f(x) = 3^x$ for Exercises 2 and 3. 3. Is $f(4)$ greater than or less than $f(3)$ ? Explain how you can draw this conclusion. f(4) is greater than $f(3)$ because the function increases as x increases.		
<b>Problem Solving</b> <b>Problem Solving</b> <b>Problem Solving</b> <b>Example 1</b> <b>Subsetion</b> from the spectral functions, <i>Growth, and Decay</i> Justin drove his pickup truck about 22,000 miles in 2004. He read that in 1988 the average residential vehicle traveled about 10,200 miles, which increased by about 2.9% per year through 1994. 1. Write a function for the average mileage, $m(t)$ , as a function of <i>t</i> , the time in years since 1988. $m(t) = 10,200(1 + 0.029)^t$ 2. Assume that the 2.9% increase is valid through 2008 and use your function to complete the table to show the average annual miles driven. $\overline{t \ 10,200\ 11,436\ 12,821\ 14,374\ 16,116\ 18,068}$ 3. Did Justin drive more or fewer miles than the average residential vehicle driver in 2004? by how much (to the nearest 100 miles)? He drove more miles driven for a slight truck, driver in 2004? by how much? About 34,000 miles Me drove fewer miles than the average light truck driver in 2004? by how much? Me drove fewer miles than the average light truck driver in 2004? by how much? Me drove fewer miles than the average light truck driver in 2004? by how much? Me drove fewer miles than the average light truck driver in 2004? by how much? Me drove fewer miles than the average light truck driver in 2004? by how much? Me drove fewer miles than the average light truck driver in 2004? by how much? Me drove fewer miles than the average light truck driver by about 12,000 miles. Justin bought his truck new for \$32,000. Its value decreases 9.0% action were the stan answere stante decreases 9.0%	<b>EXAMPLE 1</b> <b>Reading Strategy</b> The available appears as an exponent: $f(x) = ab^x$ , where <i>a</i> is a constant and <i>b</i> is the base. Depending on the value of <i>b</i> , the function either increases (grows) or decreases (decays). You can draw conclusions about the function and its graph based on the value of <i>b</i> . <b>Exponential Growth</b> An exponential function shows growth if $a > 0$ and $b > 1$ . <b>Exponential function</b> shows growth if $a > 0$ and $b > 1$ . <b>Exponential function</b> shows growth if $a > 0$ and $b > 1$ . <b>Exponential function</b> shows growth if $a > 0$ and $b > 1$ . <b>Exponential function</b> shows growth if $a > 0$ and $b > 1$ . <b>Exponential function</b> shows growth if $a > 0$ and $b > 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> f(x) = $3^x$ for Exercises 2 and 3. 2. Does the function $f(x) = 3^x$ for Exercises 2 and 3. 3. Is $f(4)$ greater than or less than $f(3)$ ? Explain how you can draw this conclusion. <b>Exponential function</b> f(x) is greater than f(3) because the function increases as x increases.		
<b>Problem Solving</b> <b>Problem Solving</b> <b>Problem Solving</b> <b>Problem Solving</b> <b>Solving</b> <b>Problem Solving</b> <b>Problem Solving</b> <b></b>	<b>EXAMPLE 1</b> <b>Reading Strategy</b> <b>Drawing Conclusions</b> In an exponential function, the variable appears as an exponent: $f(x) = ab^x$ , where <i>a</i> is a constant and <i>b</i> is the base. Depending on the value of <i>b</i> , the function either increases (grows) or decreases (decays). You can draw conclusions about the function and its graph based on the value of <i>b</i> . <b>Exponential Growth</b> An exponential function shows growth if $a > 0$ and $b > 1$ . <b>Exponential function</b> shows growth if $a > 0$ and $b > 1$ . <b>Exponential function</b> shows growth if $a > 0$ and $b > 1$ . <b>Exponential function</b> shows growth if $a > 0$ and $b > 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> f(x) = $3^x$ for Exercises 2 and 3. 2. Does the function $f(x) = 3^x$ for Exercises 2 and 3. 3. Is $f(4)$ greater than or less than $f(3)$ ? Explain how you can draw this conclusion. <b>f</b> (4) is greater than f(3) because the function increases as x increases. Use the function $f(x) = 0.4^x$ for Exercises 4 and 5. 4. Draw the function $f(x) = 0.4^x$ for Exercises 4 and 5.		
<b>Problem Solving</b> <b>Problem Solving</b> <b>Problem Solving</b> <b>Sumplemental Functions, Growth, and Decay</b> Justin drove his pickup truck about 22,000 miles in 2004. He read that in 1988 the average residential vehicle traveled about 10,200 miles, which increased by about 2.9% per year through 1994. 1. Write a function of the average mileage, $m(t)$ , as $m(t) = 10,200(1 + 0.029)^t$ 2. Assume that the 2.9% increase is valid through 2008 and use your function to complete the table to show the average annual miles driven. $\underline{Wat} = 1088 \ 1992 \ 1996 \ 2000 \ 2004 \ 2008 \ 12,0001 \ 10,200 \ 11,436 \ 12,821 \ 14,374 \ 16,116 \ 18,068$ 3. Did Justin drive more or fewer miles than the average residential vehicle driver in 2004? by how much (to the nearest 100 miles)? He drove more miles; about 5,900 miles more. 4. Later Justin read that the annual mileage for light trucks increased by 7.8% per year from 1988 to 1994. 5. Graph the function. Then use your graph to estimate the average number of miles driven in glight truck, <i>n(t)</i> , as a function of <i>t</i> , the time in years since 1988. He assumes that the average light truck driver in 2004? by how much? He drove fewer miles than the average light truck driver in 2004? by how much? He drove fewer miles than the average light truck driver in 2004? by how much? He drove fewer miles than the average light truck driver in 2004? by how much? He drove fewer miles than the average light truck driver in 2004? by how much? He drove fewer miles than the average light truck driver in 2004? by how much? He drove fewer miles than the average light truck driver in 2004? by how much? He drove fewer miles than the average light truck driver by 32,000. Its value decreases 9.0% Subsci by set. Choose the letter for the best answer. 5. Which function represents the yearly value of Justin's truck? A ( $t'' = 3200(1 + 0.91^{t'})$	<b>EXAMPLE 1</b> <b>Reading Strategy</b> <b>Drawing Conclusions</b> In an exponential function, the variable appears as an exponent: $f(x) = ab^x$ , where <i>a</i> is a constant and <i>b</i> is the base. Depending on the value of <i>b</i> , the function either increases (grows) or decreases (decays). You can draw conclusions about the function and its graph based on the value of <i>b</i> . <b>Exponential Growth</b> An exponential function shows growth if $a > 0$ and $b > 1$ . <b>Exponential function</b> shows growth if $a > 0$ and $b > 1$ . <b>Exponential function</b> shows growth if $a > 0$ and $b > 1$ . <b>Exponential function</b> shows growth if $a > 0$ and $b > 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> shows decay if $a > 0$ and $0 < b < 1$ . <b>Exponential function</b> f(x) = $3^x$ for Exercises 2 and 3. 2. Does the function $f(x) = 3^x$ for Exercises 2 and 3. 3. Is $f(4)$ greater than or less than $f(3)$ ? Explain how you can draw this conclusion. <b>F</b> (4) is greater than f(3) because the function increases as x increases. <b>Exponential growth</b> or decay? Explain. Decay:		
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