Lesson 3.5.2: Comparing Exponential Functions

Warm-Up 3.5.2

A hard rubber ball will rebound to 75% of its height each time it bounces.

1. If the ball is dropped from a height of 200 centimeters, what will the height of each bounce be after 11 bounces? Create a table and a graph of the ball's bounce rebound height over several bounces.

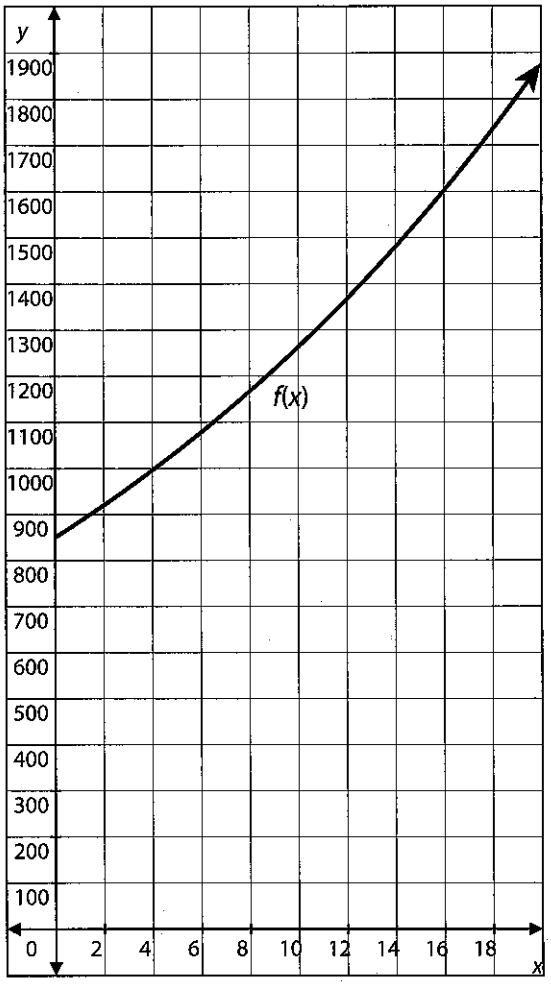
2. On which bounce will the rebound be less than 50 centimeters?

Scaffolded Practice 3.5.2

Example 1

Compare the properties of each of the following two functions over the interval [0, 16].

Function A



Function B

x	$g(x)$
0	850
4	976.55
8	1121.94
12	1288.98
16	1480.88

1. Compare the y-intercepts of each function.

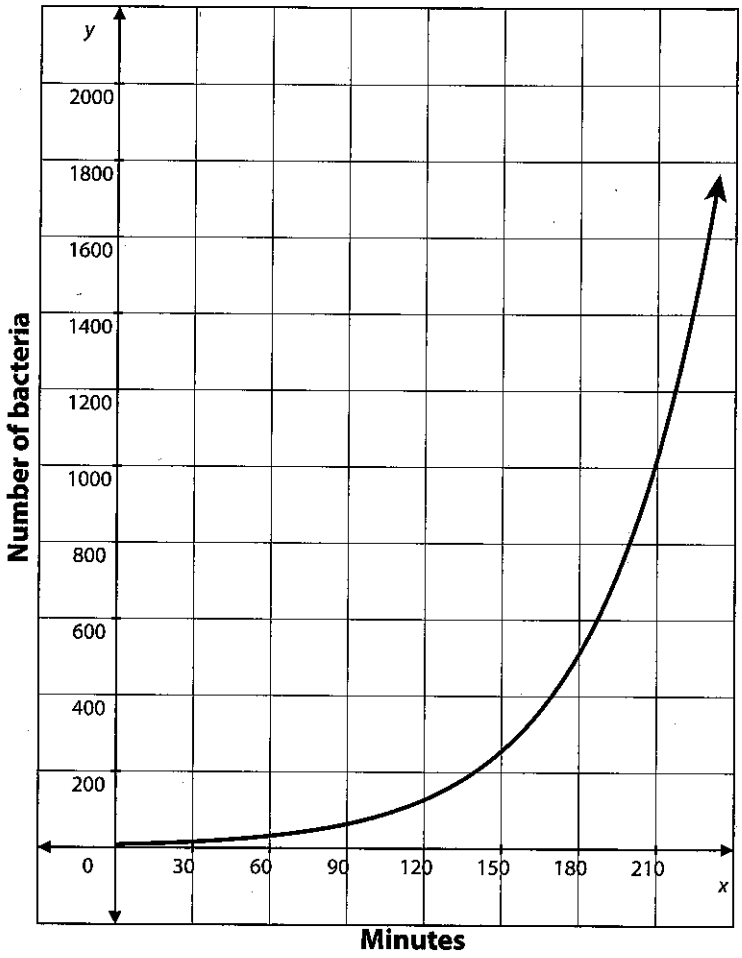
2. Compare the rate of change for each function over the interval [0, 16].

3. Summarize your findings.

continued

Example 2

A Petri dish contains 8 bacteria that double every 15 minutes. Compare the properties of the function that represents this situation to another population of bacteria, graphed below, that starts with 8 organisms over the interval [150, 210].



Example 3

A pendulum swings to 90% of its previous height. Pendulum A starts at a height of 50 centimeters. Its height at each swing is modeled by the function $f(x) = 50(0.90)^x$. The height after every fifth swing of Pendulum B is recorded in the following table. Compare the properties of each function over the interval [5, 15].

x	$f(x)$
0	100
5	59.05
10	34.87
15	20.59
20	12.16

Practice 3.5.2: Comparing Exponential Functions

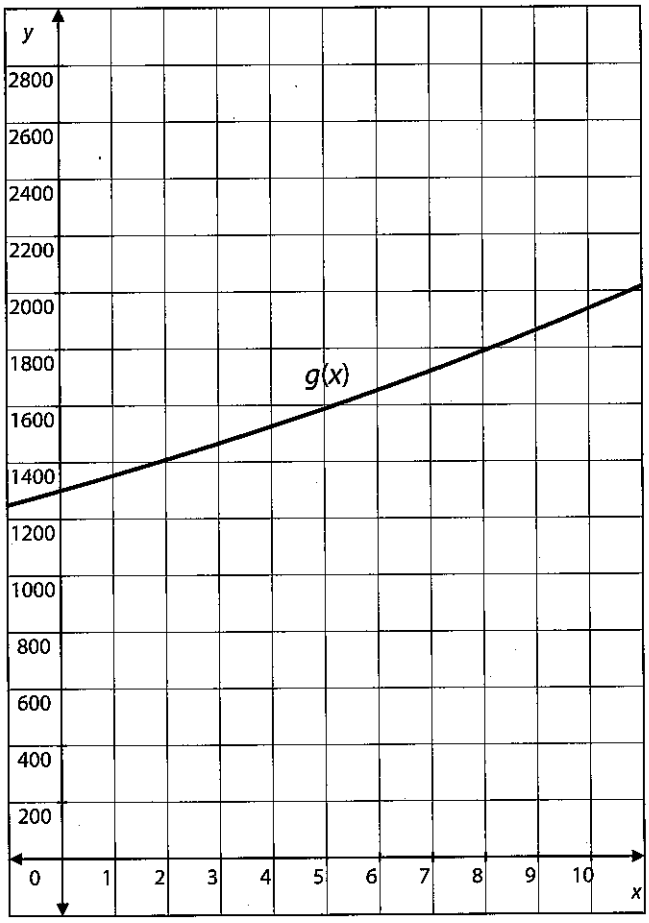
Compare the properties of the exponential functions.

1. Which function has a greater rate of change over the interval [2, 8]? Which function has the greater *y*-intercept? Explain how you know.

Function A

x	$f(x)$
0	1400
2	1546.92
4	1709.25
6	1888.62
8	2086.82

Function B



2. Which function has a greater rate of change over the interval [0, 5]? Which function has the greater *y*-intercept?

Function A

$$f(x)=\left(\frac{1}{2}\right)^x$$

Function B

$$g(x)=2^x$$

continued

3. Compare the properties of each function over the interval [2, 8].

Function A

$$f(x)=400\left(1+\frac{0.06}{12}\right)^{12x}$$

Function B

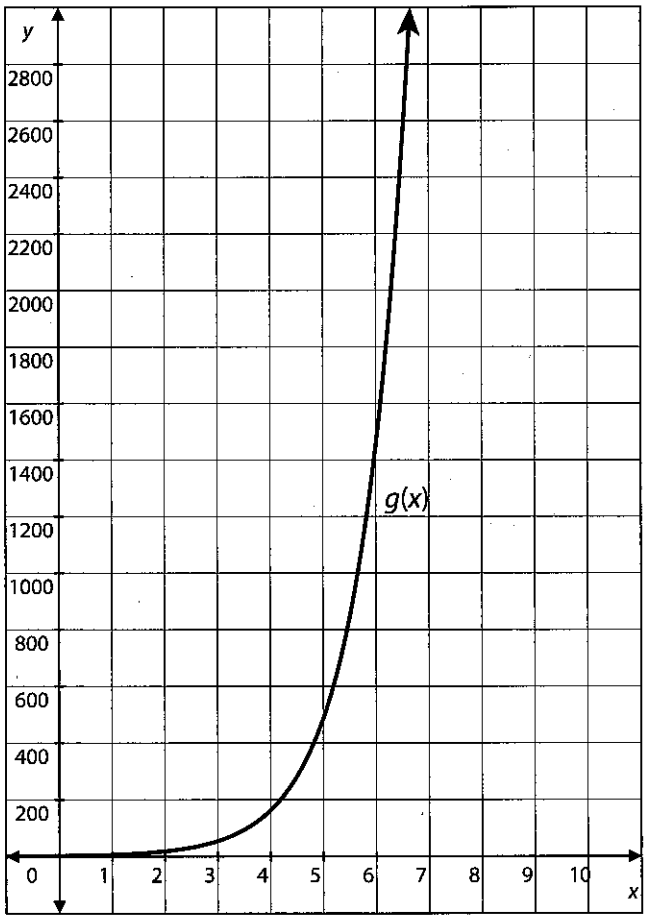
x	$g(x)$
0	350.00
2	398.45
4	453.61
6	516.40
8	587.88

4. Compare the properties of each function over the interval [0, 5].

Function A

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

Function B



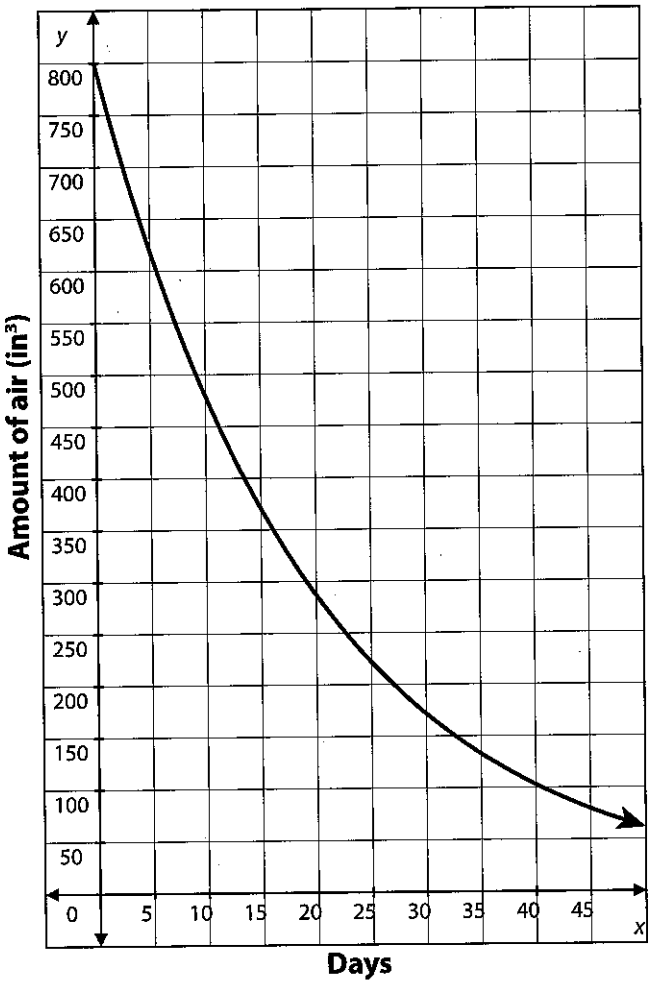
continued

5. Compare the properties of each exponential function over the interval [0, 10].

Function A

A fully inflated beach ball is losing 7.5% of its air every day. The beach ball originally contained 800 cubic inches of air.

Function B



6. Compare the properties of each exponential function over the interval [0, 5].

Function A

Jasmine received a job offer with a starting salary of $32,000 and a 1.5% increase every year.

Function B

A second job offer for Jasmine can be described by the function $f(x) = 30{,}000(1 + 0.02)^x$.

continued

7. Compare the properties of each exponential function over the interval [0, 4].

Function A

The enrollment of Eastern High School, $f(x)$, after x years is modeled by the function $f(x) = 1700(1 + 0.025)^x$.

Function B

The following table shows the enrollment of a rival high school, $g(x)$, after x years.

x	$g(x)$
0	1900
1	1872
2	1843
3	1816
4	1789

8. Compare the properties of each exponential function over the interval [1, 3].

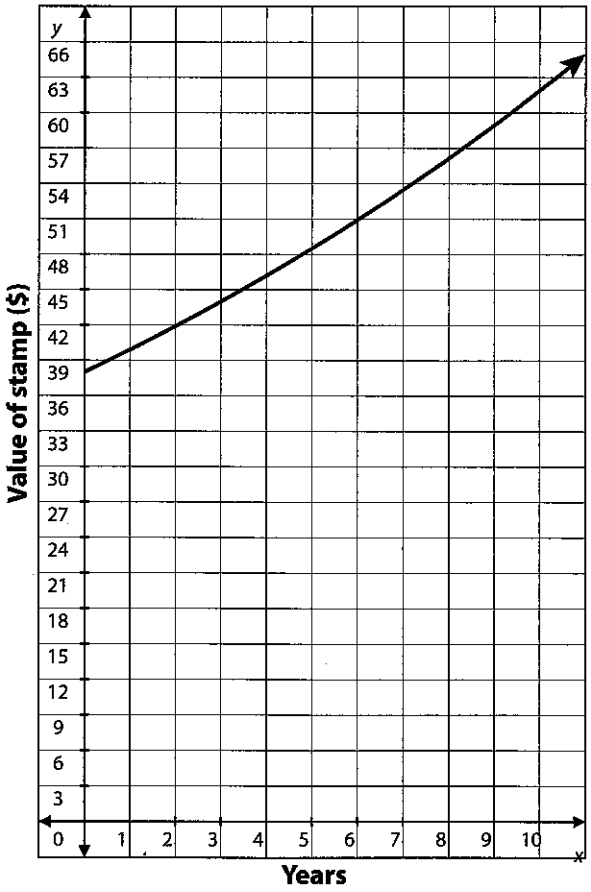
Function A

The following table shows the value in dollars of a rare stamp, $f(x)$, x years from the date purchased.

x	$f(x)$
0	52
1	54.08
2	56.24
3	58.49
4	60.83

Function B

The graph below models the value in dollars of a second rare stamp, $g(x)$, after x years.



continued

9. Compare the properties of each exponential function over the interval [0, 4].

Function A

The value of a car in dollars, $f(x)$, depreciates after each year, x. The following table shows the value of a car for each of the first 4 years after it was purchased.

x	$f(x)$
0	22,450
1	19,307
2	16,604.02
3	14,279.46
4	12,280.33

Function B

The value of a second car is modeled by the equation $g(x) = 19{,}375(1 - 0.16)^x$, where $g(x)$ represents the value of the car x years after the date it was purchased.

10. Compare the properties of each exponential function over the interval [0, 10].

Function A

An investment of $1,000 earns interest at a rate of 3.75%, compounded monthly.

Function B

The value of a second investment is modeled in the following graph.