Heritage High School

Algebra 2

Week 1: 4/6-4/12

Included in this packet:

Directions to Access Assignments Through Clever

Directions to Access the Weekly Quizizz

"Exponential Growth and Decay Functions with *e*" notes template

"Exponential Growth and Decay Functions with *e*" notes key

Week 1 Quizizz (hard copy provided for those with little to no technology access)

Assignments to be submitted by 9:00 am on Monday, April 13:

1) Big Ideas – 6.1 p. 300-301 #5-7, 10-16, 21, 23, 29, 31 and 6.2 p. 307-308 #4-11, 13, 17-21, 23-26, 31, 32, and 35

Little to No Technology Access- You may take a pic/scan your assignment and email it to your Algebra 2 teacher or drop it off at the main Administration office.

Access to Technology- Please see directions on "Accessing Big Ideas Through Clever.". The preferred method to complete your homework is electronically through Clever.

2) Weekly Quizizz

Little to No Technology Access- You may take a pic/scan your Quizizz and email it to your Algebra 2 teacher or drop it off at the main Administration office.

Access to Technology- Please see directions on "Accessing Weekly Quizizz." The game code for week 1 is: 496926.

Accessing Big Ideas Through Clever

The preferred method of completing assignments is electronically through Clever.

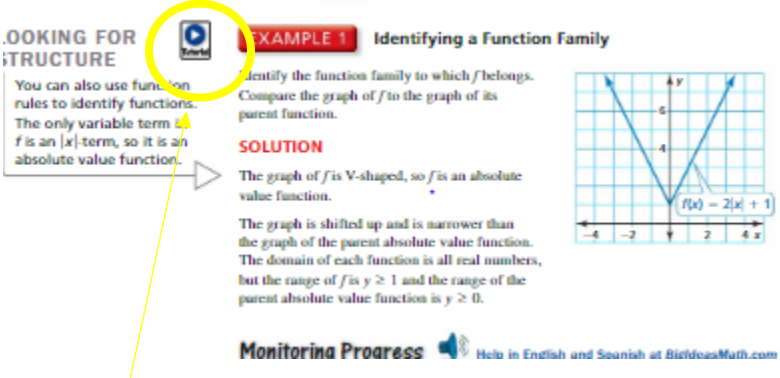
To access your assignments:

- Go to “clever.com/in/luhsd”
- Log in using your username and password as your student ID number
- Scroll down to “Math” where you will see the Big Ideas Math logo, click on “Big Ideas Math”
- If you are taking multiple math classes, you may need to select the book for the course you are working
- In the middle there is a tab that says “Assignments,” click on “Assignments”

- Choose an assignment to work on from the list. Click the pencil/enter to start the assignment.
- ***WARNING!!!!*** Clever does NOT automatically save and submit progress. Once you finish the last problem in an assignment, be sure to <u>click your name in the top-right corner and click “Submit”</u> to turn your assignment in.

To access online tutorial videos:

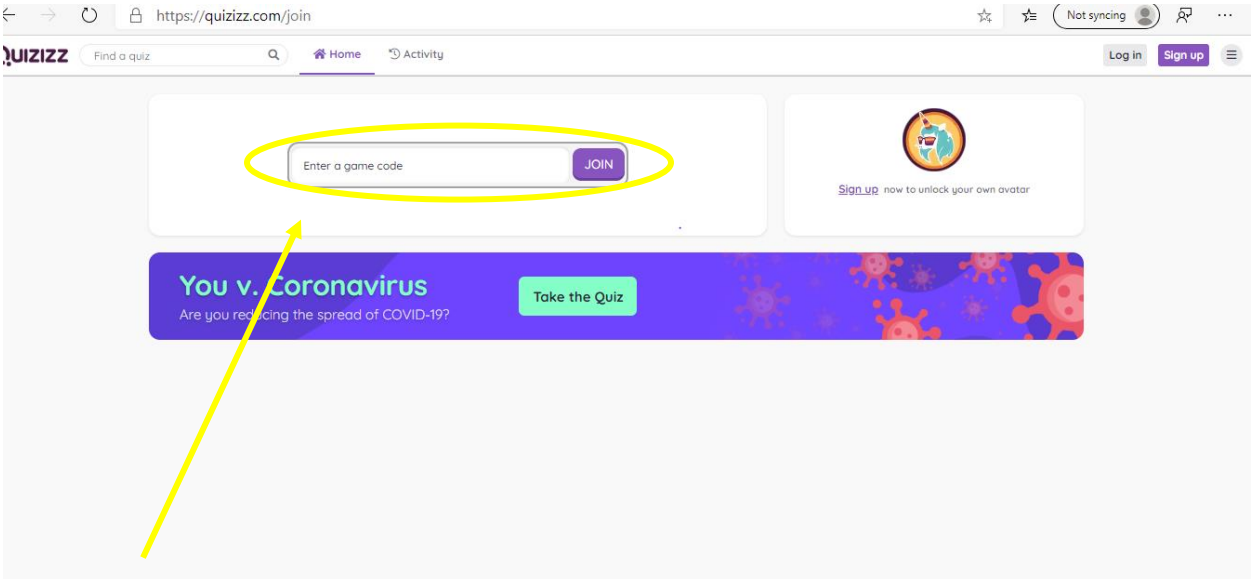
- Go to “clever.com/in/luhsd”
- Log in using your username and password as your student ID number
- Scroll down to “Math” where you will see the Big Ideas Math logo, click on “Big Ideas Math”
- If you are taking multiple math classes, you may need to select the book for the course you are working
- Click on “Student Dynamic ebook”
- You can use the “Contents” tab on the left to get to the section you wish to view
- In the section you will see examples that look similar to the below pic:



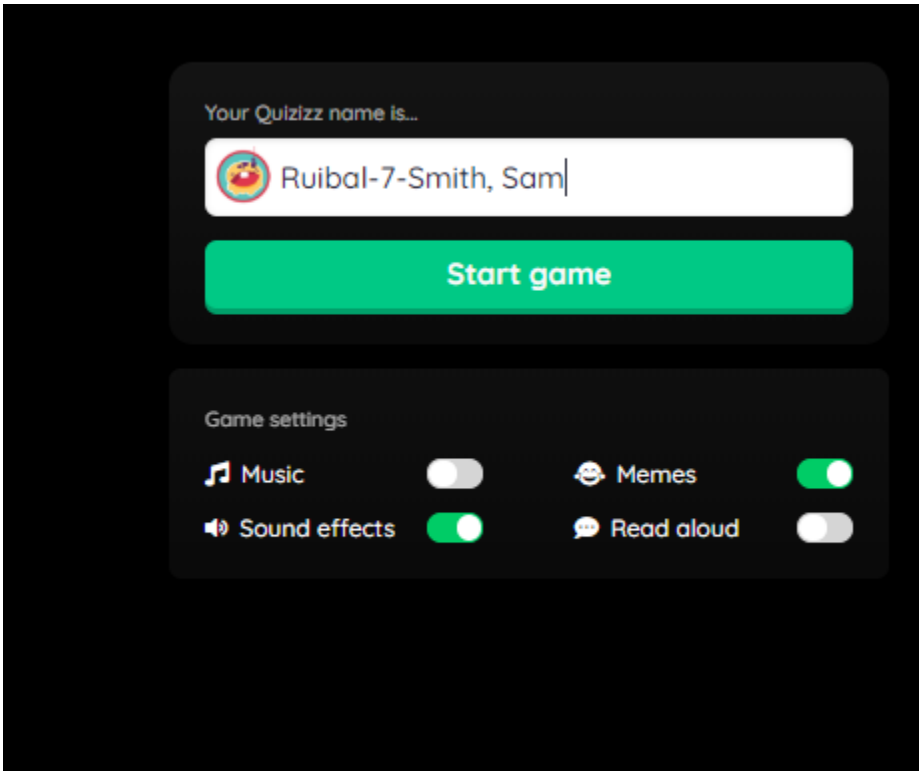
The blue circle with triangle indicates there is a tutorial video for that example. Click the icon to view.

Accessing Weekly "Quizizz"

1) Go to www.joinmyquiz.com



2) Enter the game code provided by your teacher
3) Click "Join"
4) You must use the following convention for your name to receive credit:
   Teacher last name- period- Your last name, first name



Chapter 6 Exponential and Logarithmic Functions

6.1 Exponential Growth and Decay Functions

Vocabulary:

A(n) _____ function has the form $y = ab^x$, where $a \neq 0$ and the base b is a positive real number other than 1.

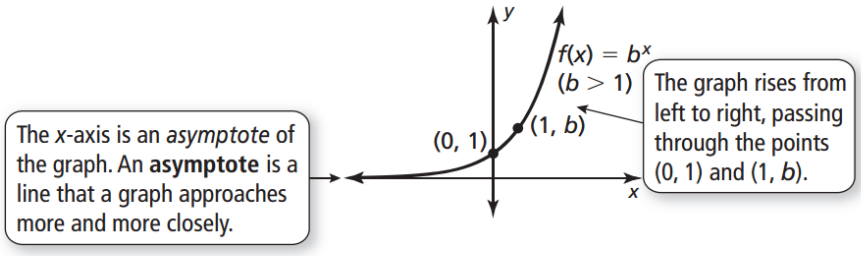
If $a > 0$ and $b > 1$, then $y = ab^x$ is an exponential _____ function, and b is called the _____ factor.

If $a > 0$ and $0 < b < 1$, then $y = ab^x$ is an exponential _____ function, and b is called the _____ factor.

A(n) _____ is a line that a graph approaches more and more closely.

Parent Function for Exponential Growth Functions

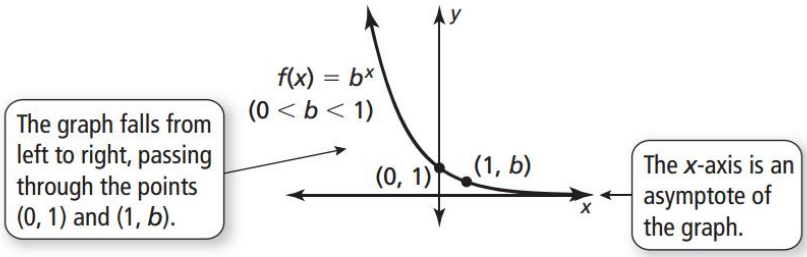
The function $f(x) = b^x$, where $b > 1$, is the parent function for the family of exponential growth functions with base b. The graph shows the general shape of an exponential growth function.



The domain of $f(x) = b^x$ is all real numbers. The range is $y > 0$.

Parent Function for Exponential Decay Functions

The function $f(x) = b^x$, where $0 < b < 1$, is the parent function for the family of exponential decay functions with base b. The graph shows the general shape of an exponential decay function.



The domain of $f(x) = b^x$ is all real numbers. The range is $y > 0$.

**When graphing exponential functions, use at least 3 coordinate points.*

Exponential Growth Model: **Exponential Decay Model:**

Example 1:

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

A. Write an exponential decay model giving the amount y (in mg) of ibuprofen in your bloodstream t hours after initial dose.

B. Estimate how long it takes for you to have 100 mg of ibuprofen in your bloodstream.

Example 2:

Rewrite the function in the form $y = a(1 + r)^t$ or $y = a(1 - r)^t$; state the growth or decay rate.

$y = a(0.25)^{t/9}$

Compound Interest: Consider an initial principal $\boldsymbol{P}$ deposited in an account that pays interest at an annual rate $\boldsymbol{r}$ (expressed as a decimal), compounded $\boldsymbol{n}$ times per year (if the account is compounded monthly then n=12). The amount $\boldsymbol{A}$ in the account after $\boldsymbol{t}$ years is given by: $A = P(1 + \frac{r}{n})^{nt}$

Example 3:

You deposit $9000 in an account that pays 1.46% annual interest. Find the balance after 3 years when the interest is compounded quarterly.

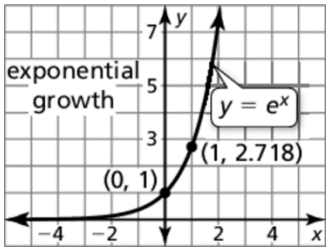
6.2 The Natural Base e

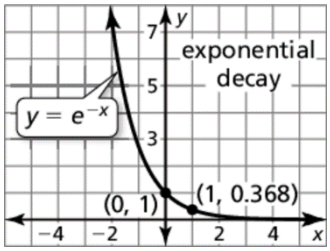
Natural Base Functions

A function of the form $y = ae^{rx}$ is called a *natural base exponential function*.

> The number **"*e*"** is just a mathematical constant, approximately equal to 2.71828. This number is also known as Euler's constant. Leonard Euler was the man who discovered it. You have a button on your calculator that has e^x on it. If you plug in e^1 you will get 2.71828.

The graphs of the basic functions $y = e^x$ and $y = e^{-x}$ are shown.



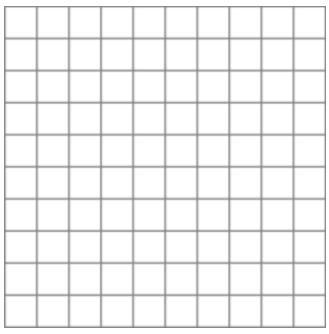


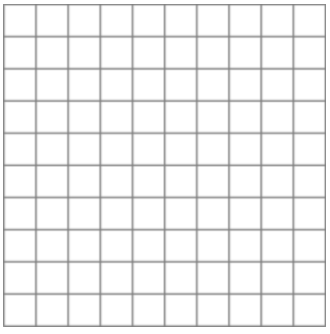
In Exercises 1–4, simplify the expression.

1. $e^{-9} \bullet e^{12}$ **2.** $\dfrac{25e^2}{35e^7}$ **3.** $\left(2e^{-3x}\right)^5 \bullet 2e^{x+1}$ **4.** $\sqrt[4]{16e^{24x}}$

In Exercises 5–6, describe the transformation of *f* represented by *g*. Then graph each function.

5. $f(x) = 3^x, g(x) = 3^x - 2$ **6.** $f(x) = e^x, g(x) = e^{x-3}$





Chapter 6 Exponential and Logarithmic Functions

6.1 Exponential Growth and Decay Functions

Vocabulary:

A(n) exponential function has the form $y = ab^x$, where $a \neq 0$ and the base b is a positive real number other than 1.

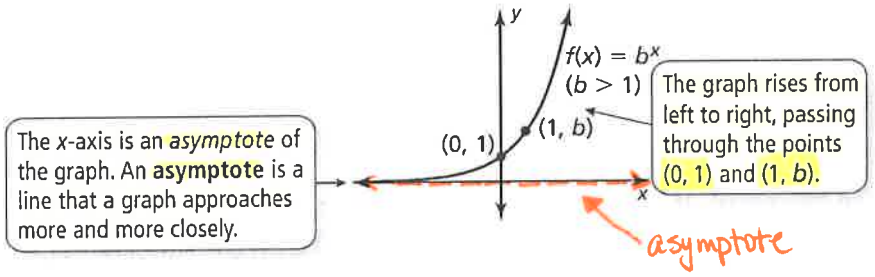
If $a > 0$ and $b > 1$, then $y = ab^x$ is an exponential growth function, and b is called the growth factor.

If $a > 0$ and $0 < b < 1$, then $y = ab^x$ is an exponential decay function, and b is called the decay factor.

A(n) asymptote is a line that a graph approaches more and more closely.

Parent Function for Exponential Growth Functions

The function $f(x) = b^x$, where $b > 1$, is the parent function for the family of exponential growth functions with base b. The graph shows the general shape of an exponential growth function.



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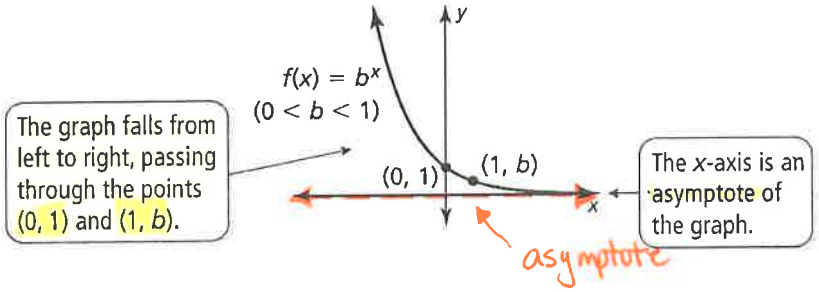

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When graphing exponential functions, use at least 3 coordinate points.

Exponential Growth Model:

$y = a(1+r)^t$ ← time

final amt. ↑ initial amount ↑ rate

Exponential Decay Model:

$y = a(1-r)^t$ ← time

final amount ↑ initial amount ↑ rate

Example 1:

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

decay

A. Write an exponential decay model giving the amount y (in mg) of ibuprofen in your bloodstream t hours after initial dose.

initial amount → $y = 325(1-.29)^t$

$y = 325(.71)^t$ ← rate changed to decimal

B. Estimate how long it takes for you to have 100 mg of ibuprofen in your bloodstream.

final amount → $100 = 325(.71)^t$

Using guess & ✓

$325(.71)^5 = 58.6$

$325(.71)^3 = 116.32$

$325(.71)^{3.5} = 98$

$t \approx 3.5$ hours

Example 2:

Rewrite the function in the form $y = a(1+r)^t$ or $y = a(1-r)^t$; state the growth or decay rate.

$y = a(0.25)^{t/9}$

$y = a[(0.25)^{1/9}]^t$

$y = a(.86)^t$

$y = a(1-.14)^t$ → Decay rate .14 or 14%

Compound Interest: Consider an initial principal P deposited in an account that pays interest at an annual rate r (expressed as a decimal), compounded n times per year (if the account is compounded monthly then n=12). The amount A in the account after t years is given by:

$A = P(1+\frac{r}{n})^{nt}$ ← rate, t=time (years)

final amt. ↑ initial amt. ↑ n= how often it is compounded in a year.

Example 3:

initial amount → You deposit $9000 in an account that pays 1.46% annual interest. Find the balance after 3 years when the interest is compounded quarterly.

r=.0146

n=4

t=3

$A = 9000(1+\frac{.0146}{4})^{4(3)}$ ← Plug entire thing into calculator.

$A = \$9,402.21$

6.2 The Natural Base e

Natural Base Functions

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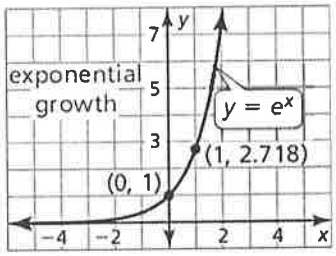
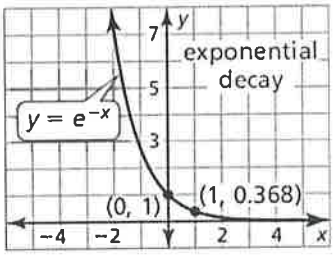




In Exercises 1–4, simplify the expression.

1. $e^{-9} \cdot e^{12}$

$= e^{-9+12}$

$= e^3$

2. $\frac{25e^2}{35e^7}$

$= \frac{5 \cdot 5 \cdot e \cdot e}{5 \cdot 7 \cdot e \cdot e \cdot e \cdot e \cdot e \cdot e \cdot e}$

$= \frac{5}{7e^5}$

3. $(2e^{-3x})^5 \cdot 2e^{x+1}$

$= (32e^{-15x})(2e^{x+1})$

$= 64e^{-15x+x+1}$

$= 64e^{-14x+1}$

4. $\sqrt[4]{16e^{24x}}$

$= \sqrt[4]{2 \cdot 2 \cdot 2 \cdot 2 \, e^x \cdot e^x \cdot e^x \cdot e^x \cdots}$

24 of these. (6 sets of 4)

$= 2e^{6x}$

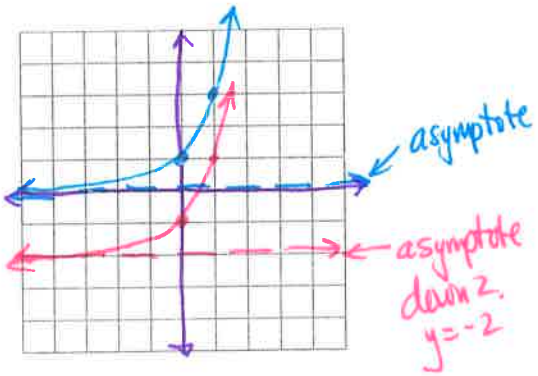
In Exercises 5–6, describe the transformation of *f* represented by *g*. Then graph each function.

5. $f(x) = 3^x, g(x) = 3^x - 2$

x	3^x	f(x)
0	3^0	1
1	3^1	3

shifted down 2

x	$3^x - 2$	g(x)
0	$3^0 - 2$	−1
1	$3 - 2$	1

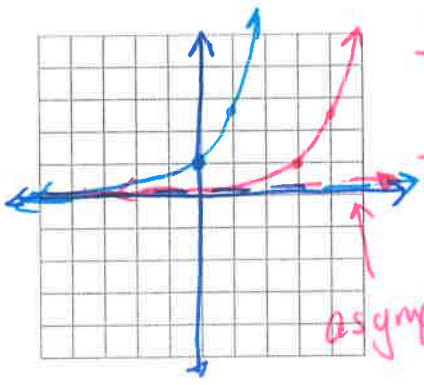


6. $f(x) = e^x, g(x) = e^{x-3}$

right 3

x	e^x	f(x)
0	e^0	1
1	e^1	2.718

x	e^{x-3}	g(x)
3	e^{3-3}	
	e^0	1
4	e^{4-3}	
	e^1	2.718



NAME : _____

CLASS : _____

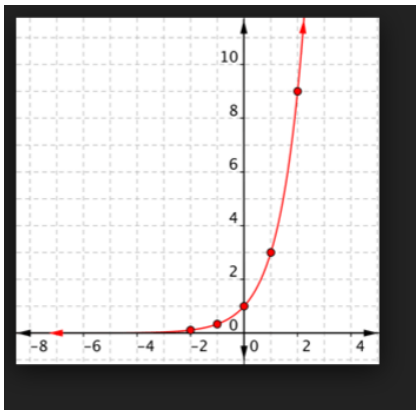
DATE : _____

Algebra 2 - Week 04/06-04/10 - Exponential Growth and Decay

10 Questions

1. A population of fish starts at 8,000 and decreases by 6% per year. What is the population of fish after 10 years?

- [ ] a) 14327
- [ ] b) 839
- [ ] c) 4309
- [ ] d) 7680

2. 

The growth factor for this graph is

- [ ] a) 2
- [ ] b) 4
- [ ] c) 1
- [ ] d) 3

3. The population of the city of Brownville has grown according to the mathematical model $y=720{,}500(1.022)^x$, where x is the number of years since January 1980. What is the was the population of Brownville in January 1980?

- [ ] a) 1.022 people
- [ ] b) 1022 people
- [ ] c) 720,500 people
- [ ] d) 102.2 people

4. Suppose you deposit $3000 in a savings account that pays interest at an annual rate of 4%. What is the growth factor?

- ☐ a) .96
- ☐ b) 1.04
- ☐ c) $3000
- ☐ d) 1.4

5. Shawn is buying a new Jet Ski for $12,500. He is considering two credit options. Option A offers a 6 year loan with 8.5% interest compounded quarterly, while Option B offers a 5 year loan with 10% interest compounded annually. Which is the better option and how much will he save?

- ☐ a) A; $495.21
- ☐ b) A; $573.83
- ☐ c) B; $495.21
- ☐ d) B; $573.83

6. Select all of the following functions that represent exponential growth.

- ☐ a) $y = 6^x$
- ☐ b) $y = (0.6)^x$
- ☐ c) $y = \left(\frac{4}{3}\right)^x$
- ☐ d) $y = (1.2)^x$
- ☐ e) $y = \left(\frac{5}{6}\right)^x$

7.

x	$h(x)$
-2	50
-1	100
0	200
1	400
2	800

Which statement does not describe this function?

- ☐ a) This function is an example of exponential growth.
- ☐ b) The range for this function is $y > 0$.
- ☐ c) This function has a y-intercept at (0, 200).
- ☐ d) The growth factor for this function is 4.

8. An antibiotic is introduced into a colony of 12,000 bacteria during a laboratory experiment. The colony is decreasing by 14.9% per minute. Which function can be used to model the number of bacteria in the colony after x minutes?

☐ a) $f(x) = 12000(1 + 14.9)^x$

☐ b) $f(x) = 12000(1 + 0.149)^x$

☐ c) $f(x) = 12000(1 - 14.9)^x$

☐ d) $f(x) = 12000(1 - 0.149)^x$

9. Which of the following functions shows an initial amount of $15 and an increase of 35% each year?

☐ a) $y = 35(1.15)^x$

☐ b) $y = 15(0.35)^x$

☐ c) $y = 15(35)^x$

☐ d) $y = 15(1.35)^x$

10. Mark took a loan out for $25,690 to purchase a truck. At an interest rate of 5.2% compounded monthly, how much total will he have paid after 5 years?

☐ a) $33,672.68

☐ b) $34,710.88

☐ c) $34,157.04

☐ d) $33,299.42