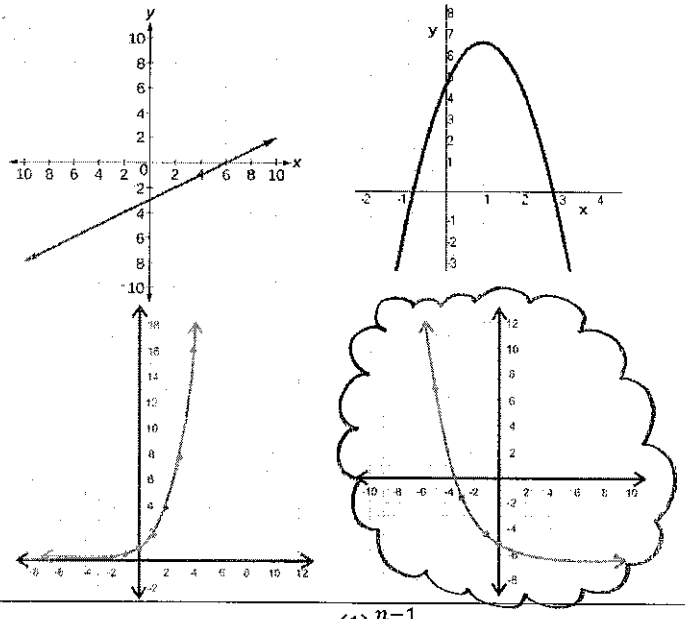
Unit 6: Exponential Functions Study Guide (SEMESTER)

Calculator Inactive

1.) Which graph models exponential decay?



2.) Which scenario models an exponential function?

A. A taxi charges an initial fee of \$2.00 and \$1.50 for each additional mile.

B. The population of a town decreases by 15% each year.

C. An airplane flying at an altitude of 33,000 feet descends at a rate of 20 feet per minute.

D. The amount of commission a worker makes who earns 8% commission on his sales

3.) The function $g_n = 128\left(\frac{1}{4}\right)^{n-1}$ represents the nth term in a sequence. What is fourth term in the sequence?

128, 32, 8, 2 $\quad a_4 = 2$

4.) Two functions are shown below:

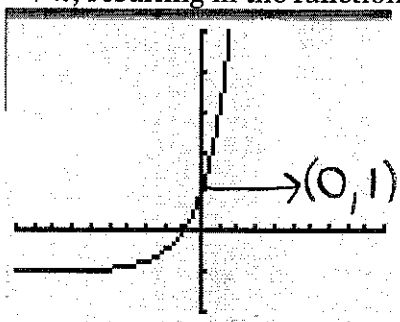
$$f(x) = \frac{1}{2}(2)^x$$

$$g(x) = 5x + 2$$

What is the first positive value of x such that $f(x) \geq g(x)$? $x = 0$

x	f(x)	g(x)
0	1/2	2
1	1	7
2	2	12
3	4	17
4	8	22
5	16	27
6	32	32

5.) The function $f(x) = 2(2)^x$ was replaced with $f(x) = 2(2)^x + k$, resulting in the function below.



What is the value of k?

$2 + k = 1$

$k = -1$

6.) In which function is the value of y increasing by a constant percent rate per unit change of x?

A. $f(x) = 10\left(\frac{1}{8}\right)^x$

B. $f(x) = 17\left(\frac{3}{2}\right)^x$

C. $f(x) = -2(-0.75)^x$

D. $f(x) = 8(0.99)^x$

7.) Rodney offers his sister two different pay options to help him mow lawns.

- Option 1: \$7.00 for each hour she works.
- Option 2: \$0.25 for the first hour and then double the amount of money she earns each additional hour she works.

After how many hours would Option 2 have a higher hourly pay?

9 hours.

hrs.	1	2	3	4	5	6	7	8	9
opt. 1	7	14	21	28	35	42	49	56	63
opt. 2	.25	.50	1	2	4	8	16	32	64

Unit 5: Exponential Functions Study Guide (SEMESTER)

Calculator Active

1.) What is the eighth term in the geometric sequence?

$g_n = -108\left(\frac{1}{3}\right)^{n-1}$

$g_8 = -108\left(\frac{1}{3}\right)^7$

$g_8 = \frac{-4}{81}$

2.) Write an equation that correctly models the relationship between hours passed, h, and the number of bacteria present, b, as shown in the table.

$b = 3^h$

Hours	0	1	2	3	4
Amount of Bacteria	1	3	9	27	81

3.) Which function models exponential growth?

A. $f(x) = 2.4(1.2)^x$

B. $f(x) = 2.4(.92)^x$

C. $f(x) = 4.2(-1.1)^x$

D. $f(x) = 4.2\left(\frac{4}{5}\right)^x$

4.) Marquis dropped a ball from a height of 500 centimeters. The sequence below shows the height of the ball, in centimeters, during its first three bounces.

125, 31.25, 7.8125, ...

÷4 ÷4

a_1

$r = \frac{1}{4}$

Which formula could be used to determine the height of the ball after n bounces?

A. $h(n) = 125(4)^n$

B. $h(n) = 500(4)^{n-1}$

C. $h(n) = 125\left(\frac{1}{4}\right)^{n-1}$

D. $h(n) = 500\left(\frac{1}{4}\right)^{n-1}$

5.) Many times a tweet will be tweeted and then retweeted with the possible number of retweets growing exponentially. Javar modeled this phenomenon with the function $f(x) = 4(2)^x$, using x to represent the number of intervals in which the tweet was retweeted.

A. What were the original number of tweets?

$a_1 = 4$

B. What is the common ratio in the function?

$r = 2$

6.) The equation $y = 325(1.06)^x$ models the value of an investment after x years. Which value models the initial amount of the investment?

$a = \$325$

7.) The number of kilograms, y, of a radioactive element that remains after t hours is modeled by the equation $y = .47(0.83)^t$. What is the rate of decrease of this radioactive element?

$1 - r = 0.83$

$-1 \quad -1$

$-r = -.17$

$\frac{-r}{-1} = \frac{-.17}{-1}$

$r = 17\%$

8.) Sarah invests $2,517 in an account that is compounded annually and pays an interest of 2.4% each year. By what factor is the investment increasing every year?

$1 + .024$

1.024

r = .5

9.) The equation $y = 425(1.06)^x$ models the value of an investment after x years. Which statement is true about the value of the investment?

a. The value of the investment is growing by 6% each year.

b. The value of the investment is decreasing by 6% each year.

c. The value of the investment is growing my $425 each year.

d. The value of the investment is decreasing by $425 each year.

10.) A stock loses half its value every week. If the stock was worth $300 starting out, what is it worth after 4 weeks at this rate of decline?

$y = 300(1-.5)^4$

$y = 300(.5)^4$

$18.75

11.) The Hatch family wants to start saving for a college fund. They deposited $1000 into a bank account that will earn 3% interest annually. How much will the Hatch family have saved for the college fund after 12 years?

$y = 1000(1.03)^{12}$

$1,425.76

12.) A certain bacteria doubles every 4 hours. If you started with 37 bacteria, how many would you have after 12 hours?

A. 592 bacteria B. 296 bacteria

C. 151, 552 bacteria D. 111 bacteria

$y = 37(2)^{t/4}$

$y = 37(2)^3$

13.) Susie did an experiment to compare two methods of warming an object. The results are shown in the table below.

Time (Hours)	Method 1 Temperature	Method 2 Temperature
0	0	1.5
1	5	3
2	10	6
3	14	12
4	18	24
5	23	48

Did either method change at a constant rate? Did either method change exponentially? Explain

method 2 changed exponentially with a common Ratio of 2.

14.) Clara and Michelle's parents started saving for college in 1998.

y_1

- Clara's college fund can be modeled by the function $f(x) = 500x + 2{,}500$ and
- Michelle's college fund can be modeled by the function $g(x) = 2500(1.1)^x$, where x is the number of years since 1998.

y_2 y_2 >

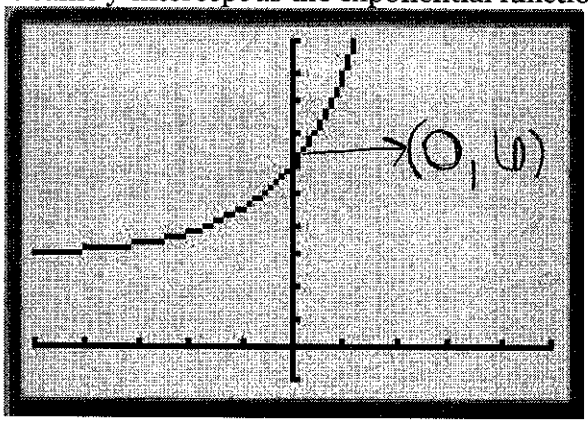
About what year will Michelle's college fund first exceed Clara's college fund?

y_1

y_2 is bigger than y_1 when $x = 15$.

$1998 + 15 = 2013$

15.) Which linear function has the same y-intercept as the exponential function graphed below?



A. $3x - 2y = 16$

B. $4x + y = 5$ → $y = -4x + 5$

C. $x - 6y = 6$

D. $9x + 3y = 18$ → $\frac{3y}{3} = \frac{-9x}{3} + \frac{18}{3}$, $y = -3x + 6$

16.) Identify the y-intercept of the function below.

$$f(x) = 3\left(\frac{4}{5}\right)^x - 7$$

3 − 7 (0, −4)

17.) A club began with four members. Each month, each member brought one new member. Which function can be used to determine the number of members x months after the club began?

A. $f(x) = 2x + 4$

B. $f(x) = 4(2)^x$

C. $y = 4(4)^x$

D. $f(x) = 4x + 2$

18.) A scientist studying a population of birds discovered that the number of birds doubled every year. Which function would ***best*** represent this situation?

A. Linear function with a growth rate of 200% every year

B. Linear function with a growth rate of 100% every year

C. Exponential function with a growth rate of 200% every year

D. Exponential function with a growth rate of 100% every year

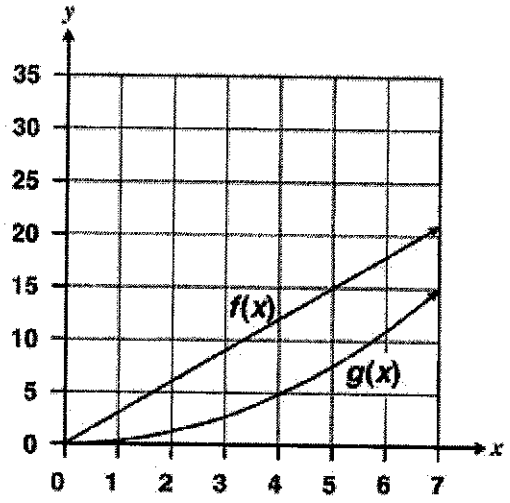
19.) Given, $f(x) = 0.25(1.25)^x$ identify the growth/decay factor, growth/decay rate, and the initial value.

Growth/Decay Factor: 1.25

Growth/Decay Rate: 25%

Initial Value: 0.25

20.) Which statement BEST explains the behavior of the graphs of the functions as x increases?



A. $g(x)$ eventually exceeds $f(x)$ because the rate of change of $f(x)$ increases as x increases, whereas the rate of change of $g(x)$ is constant.

B. $g(x)$ eventually exceeds $f(x)$ because the rate of change of $g(x)$ increases as x increases, whereas the rate of change of $f(x)$ is constant.

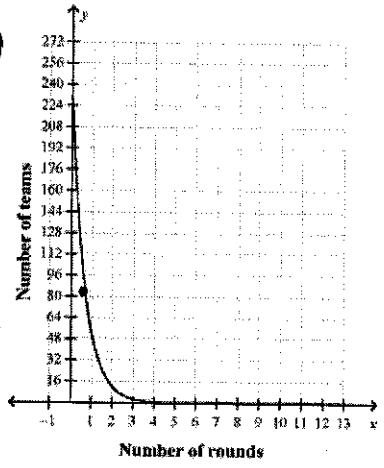
C. $f(x)$ eventually exceeds $g(x)$ because the rate of change of $g(x)$ decreases as x increases, whereas the rate of change of $f(x)$ is constant.

D. $f(x)$ eventually exceeds $g(x)$

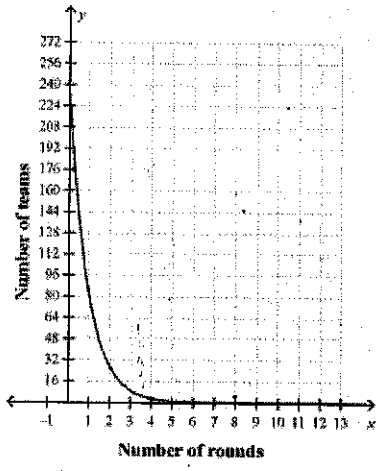
21.) A basketball tournament starts out with 243 teams. One third of the teams are eliminated after each round. What is the graph of the equation?

$y = 243\left(\frac{1}{3}\right)^x$

a.



c.



b.