Algebra 1 Exponential Functions UNIT 5 REVIEW

Name:_____Date:_____Period:____

Determine if the equation represents exponential growth or decay. Then state the initial value and the constant percent change for the data set.

1. $y = 10(.92)^t$

growth or decay: _____

initial value: _____

percent change: _____

2. $y = 200(1.075)^t$

growth or decay: _____

initial value: _____

percent change: _____

3. The bacteria E.coli triples every hour. Initially, there was a colony of 20 e.coli

a. What is the growth factor in this situation? _____

b. Write the model to represent this situation:

c. Predict the population after 8 hours. What is the equation you will use to solve this?

d. Determine when the population will reach 400 bacteria.

4. A certain medication is eliminated from the bloodstream at a rate of about 11% per hour. The initial dose is 800 mg.

a. Write the exponential model to represent this situation:

b. Predict amount of medication left after 10 hours.

c. At the time they take your blood, 200 mg of medication are still present. How many hours have passed since you took your initial dose?

5. A population of bacteria doubles every **20 minutes**. If the initial bacteria colony contains 100 cells, how many bacteria will there be after **3 hours**?
SHOW ALL WORK!

A. Write the model that best represents this situation:

B. In this case, *t* represents time in _____ (what are the units?)

C. How many groups of 20 minutes are in 3 hours?

D. Answer the question:

6 The population of Coolville High School is presently 1500 students. If the number of students is predicted to increase at a rate of 4.5% over the next 6 years, write an equation that you could use to predict the population of the high school in 2023. Then find the solution.

Equation: _____

students in 2020: _____

7. The population of Henderson City was 3,381,000 in 1994, and is growing at an annual rate of 1.8%. If this growth continues, what will the approximate population of Henderson City be in the year 2000.

(1) 3,696,000 (2) 3,763,000 (3) 3,798, 000 (4) 3,831,000

8. A culture of bacteria contained 3,842,700 cells on one day and is growing at a daily rate of 6.8%. How many cells would be present 4 days later?

(1) 4,999,442 (2)5,339,404 (3) 5,043,878 (4) 15,370,800

9. Since January 1980, the population of the city of Brownville has grown according to the mathematical model $y = 4000(1.036)^{x}$, where x is the number of years since January 2000. Write a real world scenario that could be modeled by this equation.

10. The model $y = 20{,}000(.88)^t$ represents the value, y, of a car after t years.

a. How much is the car worth originally?

b. By what percent is it depreciating per year?

c. How much will it be worth in 7 years?

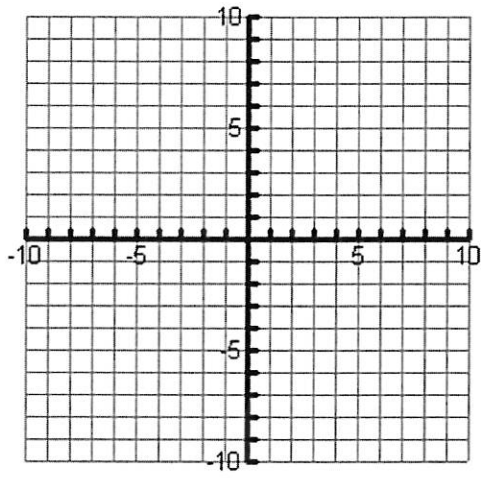
11. HONORS: Find the total investment when $7,300 is invested at an annual rate of 7% compounded semiannually for 3 years.

12: HONORS: Find the total investment when $21,000 is invested at an annual rate of 13.6% compounded quarterly for 4 years

Graphing by hand. Complete the table of values below. Then use your table to sketch a graph and identify the domain and range for each.

13.

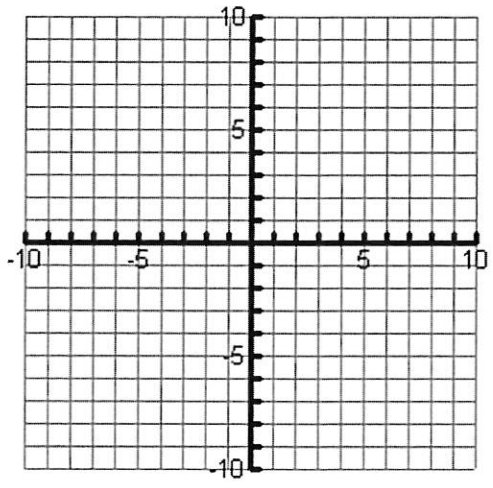
x	$y = 10\left(\frac{1}{2}\right)^x$
-1	
0	
1	
2	
3	



Exponential Functions UNIT 5 REVIEW

14.

X	$y = 2(2)^x$
-2	
-1	
0	
1	
2	



Simplify

15. $\left(x^6\right)\left(x^2\right)$

12. $\left(x^3\right)^5$

17. $\frac{a^8}{a^2}$

18. m^{-2}

19. $\left(\frac{5}{7}\right)^{-1}$

20. $15r^0$

21. $\left(2x^3\right)(4x)$

22. $\left(2b^2\right)^3$

23. $\frac{25a^6}{5a^3}$

24. $5x^{-1}$

25. $\left(\frac{5}{3}\right)^{-2}$

26. $(15x)^0$

27. a^5 (a) (a^7)

27. $(r^3t^4)(r^4t^4)$

28. $(x^3y^4)(xy^3)$

29. $(bc^3)(b^4c^3)$

30. $(-3mn^2)(5m^3n^2)$

31. In terms of exponents $(3^3)^2$

32. $(3s^2t^2)(-4s^3t^2)$

33. $x^3(x^4y^3)$

34. $(-2g^2h^4)^3$

35. $-\frac{3}{4}a(a^2b^3c^4)$

36. $(\frac{1}{2}w^3)^2(w^4)^2$

38. $(\frac{2}{3}y^3)(3y^2)^3$

39. $\frac{b^6c^5}{b^3c^2}$

40. $\frac{(-a)^4b^8}{a^4b^7}$

41. $\frac{(-x)^3y^3}{x^3y^6}$

31. $\frac{12ab^5}{4a^4b^3}$

32. $\frac{24x^5}{-8x^2}$

33. $\frac{-9h^2k^4}{18h^5j^3k^4}$

34 $\frac{(u^{-3}v^3)^2}{(u^3v)^{-3}}$

35. $\left(\frac{-2x^4y}{4y^2}\right)^0$

36. $28a^{-4}b^0$

37. Write in scientific notation:

a. 9,040,000,000

b. 0.0156

38. Simplify

a. $8(2.3\times10^{-4})$

b. $(1.2\times10^{6})(8.6\times10^{-4})$

c. $\frac{3.6\times10^{9}}{1.2\times10^{5}}$

HONORS: Write in radical form and evaluate:

39. $9^{\frac{3}{2}}$

40. $16^{\frac{5}{4}}$

41. $9^{\frac{2}{3}}$

HONORS: Solve equations.

42. $4^{2p}=4^{-2p-1}$

43. $2^{2x+2}=2^{3x}$

44. $64*16^{-3x}=16^{3x-2}$

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Algebra 1 Exponential Functions UNIT 5 REVIEW

Name: Key Date: Period:

Determine if the equation represents exponential growth or decay. Then state the initial value and the constant percent change for the data set.

1. $y = 10(.92)^t$ $y=10(1-.08)^t$

growth or decay: decay

initial value: 10

percent change: 8%

2. $y = 200(1.075)^t$ $y=200(1+.075)^t$

growth or decay: growth

initial value: 200

percent change: 7.5%

3. The bacteria E.coli triples every hour. Initially, there was a colony of 20 e.coli.

a. What is the growth factor in this situation? 3

b. Write the model to represent this situation:

$y=20(3)^t$

c. Predict the population after 8 hours. What is the equation you will use to solve this?

$y=20(3)^8$ 131220 Bact

d. Determine when the population will reach 400 bacteria.

$400=20(3)^t$

$t=2.73$ hours

4. A certain medication is eliminated from the bloodstream at a rate of about 11% per hour. The initial dose is 800 mg.

a. Write the exponential model to represent this situation: $y=800(1-.11)^t$

b. Predict amount of medication left after 10 hours. $y=800(1-.11)^{10}$

$y=249.5$ mg

c. At the time they take your blood, 200 mg of medication are still present. How many hours have passed since you took your initial dose?

$200=800(1-.11)^x$

$x=11.9$ hours

Algebra 1 Exponential Functions UNIT 5 REVIEW

5. A population of bacteria doubles every **20 minutes**. If the initial bacteria colony contains 100 cells, how many bacteria will there be after **3 hours**?
SHOW ALL WORK!

A. Write the model that best represents this situation: $y = 100(2)^{t}$

B. In this case, t represents time in 20 minutes (what are the units?)

C. How many groups of 20 minutes are in 3 hours? 9

D. Answer the question:

$y = 100(2)^{9}$

$y = 51200$ cells

6 The population of Coolville High School is presently 1500 students. If the number of students is predicted to increase at a rate of 4.5% over the next 6 years, write an equation that you could use to predict the population of the high school in 2020. Then find the solution.

Equation: $y = 1500(1-.045)^{6}$

students in 2020: 1137.9

7. The population of Henderson City was 3,381,000 in 1994, and is growing at an annual rate of 1.8%. If this growth continues, what will the approximate population of Henderson City be in the year 2000.

(1) 3,696,000 (2) 3,763,000 (3) 3,798, 000 (4) 3,831,000

3762979
3763000

$y = 3381000(1+.018)^{6}$

8. A culture of bacteria contained 3,842,700 cells on one day and is growing at a daily rate of 6.8%. How many cells would be present 4 days later?

(1) 4,999,442 (2)5,339,404 (3) 5,043,878 (4) 15,370,800

$y = 3842700(1+.068)^{4}$

9. Since January 1980, the population of the city of Brownville has grown according to the mathematical model $y = 4000(1.036)^{x}$, where x is the number of years since January 2000. Write a real world scenario that could be modeled by this equation.

In 1980 the pop. in Brownville was 4000. The population is increasing at a rate of 3.6%. In 20 years the population will be $y = 4000(1.036)^{20}$ 8114.37

10. The model $y = 20{,}000(.88)^t$ represents the value, y, of a car after t years.

a. How much is the car worth originally? 20,000

b. By what percent is it depreciating per year? 12%

c. How much will it be worth in 7 years? $y = 20000(.88)^7$ ≈ 8173

11. HONORS: Find the total investment when $7,300 is invested at an annual rate of 7% compounded semiannually for 3 years.

$y = 7300\left(1 + \frac{.07}{2}\right)^{3 \cdot 2}$ ≈ 8973.56

12: HONORS: Find the total investment when $21,000 is invested at an annual rate of 13.6% compounded quarterly for 4 years

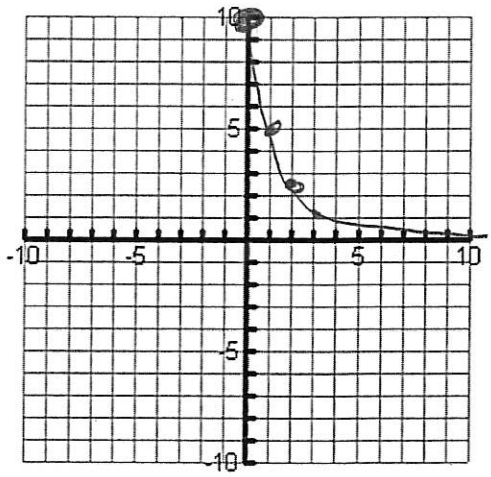
$y = 21000\left(1 + \frac{.136}{4}\right)^{4 \cdot 4}$ ≈ 35854.88

Graphing by hand. Complete the table of values below. Then use your table to sketch a graph and identify the domain and range for each.

13.

x	$y = 10\left(\frac{1}{2}\right)^x$
-1	20
0	10
1	5
2	2.5
3	1.25

$\times .5$ $\times .5$ $\times .5$ $\times .5$



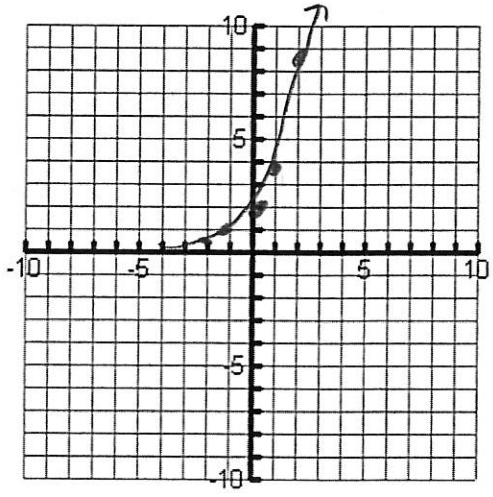
Algebra 1

Exponential Functions UNIT 5 REVIEW

14.

X	y = 2(2)^x
-2	.5
-1	1
0	2
1	4
2	8

*2 *2 *2 *2



Simplify

15. $(x^6)(x^2)$ x^8

12. $(x^3)^5$ x^{15}

17. $\frac{a^8}{a^2}$ a^6

18. m^{-2} $\frac{1}{m^2}$

19. $\left(\frac{5}{7}\right)^{-1}$ $\frac{7}{5}$

20. $15r^0$ 15

21. $(2x^3)(4x)$ $8x^4$

22. $(2b^2)^3$ $8b^6$

23. $\frac{25a^6}{5a^3}$ $5a^3$

24. $5x^{-1}$ $\frac{5}{x}$

25. $\left(\frac{5}{3}\right)^{-2}$ $\frac{5^{-2}}{3^{-2}}$ $\frac{3^2}{5^2}$ $\frac{9}{25}$

26. $(15x)^0$ 1

27. $a^5(a^1)(a^7)$ a^{13}

27. $(r^3t^4)(r^4t^4)$ r^7t^8

28. $(x^3y^4)(x^1y^3)$ x^4y^7

Algebra 1 Exponential Functions UNIT 5 REVIEW

29. $(bc^3)(b^4c^3)$

b^5c^6

30. $(-3mn^2)(5m^3n^2)$

$-15m^4n^4$

31. In terms of exponents $(3^3)^2$

3^6

32. $(3s^2t^2)(-4s^3t^2)$

$-12s^5t^4$

33. $x^3(x^4y^3)$

x^7y^3

34. $(-2g^2h^4)^3$

$-8g^6h^{12}$

35. $-\frac{3}{4}a(a^2b^3c^4)$

$-\frac{3}{4}a^3b^3c^4$

36. $(\frac{1}{2}w^3)^2(w^4)^2$

$\frac{1}{4}w^6w^8$

$\frac{1}{4}w^{14}$

38. $(\frac{2}{3}y^3)(3y^2)^3$

$\frac{2}{3}y^3 \cdot 27y^6$

$18y^9$

39. $\frac{b^6c^5}{b^3c^2}$

b^3c^3

40. $\frac{(-a)^4b^8}{a^4b^7}$

$\frac{a^4b^8}{a^4b^7}$ b

41. $\frac{(-x)^3y^3}{x^3y^6}$

$\frac{-x^3y^3}{x^3y^6}$ $\frac{-1}{y^3}$

31. $\frac{12ab^5}{4a^4b^3}$

$\frac{3b^2}{a^3}$

32. $\frac{24x^5}{-8x^2}$

$-3x^3$

33. $\frac{-9h^2k^4}{18h^5j^3k^4}$

$\frac{-1}{2h^3j^3}$

34 $\frac{(u^{-3}v^3)^2}{(u^3v)^{-3}}$

$\frac{u^{-6}v^6}{u^{-9}v^{-3}}$

u^3v^9

35. $\left(\frac{-2x^4y}{4y^2}\right)^0$

1

36. $28a^{-4}b^0$

$\frac{28}{a^4}$

37. Write in scientific notation:

a. 9,040,000,000

9.04×10^{9}

b. 0.0156

1.56×10^{-2}

38. Simplify

a. $8(2.3\times10^{-4})$

18.4×10^{-4}

$1.84 \times 10 \times 10^{-4}$

1.84×10^{-3}

b. $(1.2\times10^{6})(8.6\times10^{-4})$

10.32×10^{2}

$1.032 \times 10^{1} \times 10^{2}$

1.032×10^{3}

c. $\frac{3.6\times10^{9}}{1.2\times10^{5}}$

3×10^{4}

HONORS: Write in radical form and evaluate:

39. $9^{\frac{3}{2}}$

$(\sqrt{9})^{3}$

$(3)^{3}$

27

40. $16^{\frac{5}{4}}$

$(\sqrt[4]{16})^{5}$

$(2^{4})^{5/4}$

2^{5}

32

41. $9^{\frac{2}{3}}$

$(3^{2})^{2/3}$

$3^{4/3}$

$(\sqrt[3]{9})^{2}$ or $(\sqrt[3]{3})^{4}$

42. $4^{2p} = 4^{-2p-1}$

$2p = -2p-1$

$4p = -1$

$p = -\frac{1}{4}$

43. $2^{2x+2} = 2^{3x}$

$2x+2 = 3x$

$2 = x$

44 $64 \cdot 16^{-3x} = 16^{3x-2}$

$4^{3} \cdot (4^{2})^{-3x} = (4^{2})^{3x-2}$

$4^{3} \cdot 4^{-6x} = 4^{6x-4}$

$-6x+3 = 6x-4$

$7 = 12x$

$\frac{7}{12} = x$