Unit 5 Check Sheet

Name _____Per_____
(Print)

Exponents & Exponential Functions

- Check sheet must be turned in to receive Homework & Quiz points.
- All quiz corrections must be done for test score to replace quiz scores.
- No check sheet = No Points.
- Write quiz scores as fractions
- Lost Quizzes count as a 0.
- Quiz ratio is total points scored on quizzes and pre-test out of total possible
- Order (from top to bottom)
  - Check sheet,
  - **Quiz 1, 2, Pre-Test**
  - **Quiz corrections**

Section		HMK
5.1	**Zero and Negative Exponents** **Worksheet 5.1 #1-30 all or Math XL**	
5.2	**Exponential Functions** **Worksheet 5.2 #1-22 all or Math XL**	
5.3	**Comparing Linear and Exponential Functions** **Worksheet 5.3 #1-16 all or Math XL** **Quiz 1**	
5.4	**Exponential Growth and Decay** **Worksheet 5.4 #1-21 all or Math XL**	
5.5	**Solving Exponential Equations** **Worksheet 5.5 #1-19 all or Math XL**	
5.6	**Geometric Sequences** **Worksheet 5.6 #1-27 all or Math XL** **Quiz 2**	
Review	**Review Worksheet #1-25 all or Math XL** **Unit 5 Pre-Assessment**	
Unit Test		

Quiz 1: _____
Score/Possible

Quiz 2: _____
Score/Possible

Pre-Test: _____
Score/Possible

Total Quiz Ratio: _____
Total Score/Total Possible

Name _____ Class _____ Date _____

5.1 Practice

Form K

Zero and Negative Exponents

Simplify each expression.

1. 37^0

2. 3^{-4}

3. $\frac{5}{5^{-2}}$

4. $\frac{3}{6^{-1}}$

5. $-(5)^{-2}$

6. 112^{-1}

7. -11^0

8. $-(7n)^{-2}$

9. $-(15p)^0$

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

11. $4x^{-3}y^0$

12. $\frac{8m^{-2}}{4n^{-1}}$

13. $\frac{-6a^{-2}(bc)^2}{d^{-4}}$

14. $\left(\frac{5s}{6t}\right)^{-2}$

15. $4^{-2}h^{-4}j^3$

16. $-(6yz)^{-2}x^0$

17. $\frac{10fg^{-5}h^0}{h^{-2}}$

18. $\frac{6t^{-1}}{11(uv)^{-3}w^4}$

Name _____ Class _____ Date _____

Practice (continued) *Form K*

Zero and Negative Exponents

Evaluate each expression for $x = -2$, $y = 4$, and $z = 2$.

19. $4x^{-1}$

20. z^{-3}

21. $2xy^{-2}z^{2}$

22. $6x^{3}z^{0}$

23. $-x^{-2}$

24. $(-y)^{-3}$

Write each number as a power of 10 using negative exponents.

25. $\frac{1}{10,000}$

26. $\frac{1}{100,000}$

Write each expression as a decimal.

27. 10^{-6}

28. 6×10^{-3}

29. The population of a suburb is 4000 people. The population of the suburb is expected to double each decade. The expression $4000 \cdot 2^{d}$ models the population of the suburb after each decade d. Evaluate the expression for $d = -2$. Describe what the value of the expression represents in this situation.

30. Writing Describe how a power with a zero exponent and a power with a negative exponent can be simplified.

Name _____ Class _____ Date _____

5.2 Practice

Form K

Exponential Functions

Determine whether each table represents a linear or an exponential function. Explain. Remember that an exponential function exists when you have a constant ratio between the *y* values and a constant difference between the *x* values.

1.

x	1	2	3	4	5	6
y	2	4	8	16	32	64

2.

x	1	2	3	4	5	6
y	1	4	7	10	13	16

Determine whether each equation represents a linear or an exponential function. Remember, an exponential function takes the form $y = a \cdot b^x$ where $a \neq 0$ and $b > 0$, $b \neq 1$.

3. $y = 3 \cdot 2^x$

4. $y = 4 \cdot \left(\frac{1}{5}\right)^x$

5. $y = 5x - 8$

6. $y = 5 \cdot 1.07^x$

Evaluate each function for the given value.

7. $y = 4^x$ for $x = 3$

8. $f(x) = 2 \cdot 3^x$ for $x = 5$

9. $h(t) = 60 \cdot 1.07^t$ for $t = 8$

10. $y = 5 \cdot 7^x$ for $x = 0$

11. What is the solution of $2^x = 8$?

Name _____ Class _____ Date _____

Practice (continued) *Form K*

Exponential Functions

12. An investment of $2000 in a bank account doubles every 5 years. The function that models the growth of this investment is $f(x) = 2000 \cdot 2^x$, where x is the number of doubling periods. How much will the investment be worth after two doubling periods, or 10 years?

13. The city library will be increasing the number of books it has to loan at a rate of 5% per year. The library currently has 40,000 books. The number of books they will have in any given year is modeled by the function $h(t) = 40{,}000 \cdot 1.05^t$, where t is the number of years. How many books will the library have 8 years from now?

Graph each exponential function.

14. $y = 2^x$

15. $y = 3 \cdot 2^x$

16. $y = 5^x$

17. $y = 3 \cdot 5^x$

18. Writing Discuss the similarities and differences between the four graphs that you sketched in Exercises 14–17.

Solve each equation.

19. $2^x = 16$

20. $10 \cdot 3^x = 90$

21. $5^x - 4 = 21$

22. $4^x + 6 = 70$

Name _____ Class _____ Date _____

5.3 Practice

Form K

Comparing Linear and Exponential Functions

Determine whether each table represents a linear or an exponential function. Explain.

Hint: if the *x*-values in a table have a common difference, and all the *y*-values have a common *difference*, then the table represents a linear function. If the *x*-values in a table have a common difference, and all of the *y*-values have a common *ratio*, then the table represents an exponential function.

1.

x	−1	0	1	2
y	1	4	7	10

2.

x	1	2	3	4
y	−2	−4	−8	−16

3.

x	0	1	2	3
y	−3	2	7	12

Can you model the situation by a *linear function* or an *exponential function*? Explain.

4. Sarah's fees decrease by $5 each time she visits the chiropractor.

5. The population of a bacteria culture decreases by half every 24 hours.

6. The value of Adrian's baseball card collection has increased by 2% each year.

Which function has the greater value for the given value of x?

7. $y = 2x + 1$ or $y = 2^x + 1$ for $x = 3$

8. $y = 4 \cdot x^3$ or $y = 4 \cdot 3x$ for $x = 1$

9. Which function has the greatest value for $x = 2$?

(A) $f(x) = 3 \cdot 7^x$ (B) $f(x) = 3 \cdot x^7$ (C) $f(x) = 7x + 3$ (D) $f(x) = 7 \cdot 3^x$

Name _____ Class _____ Date _____

Practice (continued) *Form K*

Comparing Linear and Exponential Functions

State whether the equation represents an *exponential function*, a *linear function*, or *neither*.

10. $y = 4 \cdot 3^x$

11. $y = 5 \cdot x^3$

12. $f(x) = 3x + 4$

13. $g(x) = 0.25 \cdot 4^x$

14. What is the average rate of change for the function $y = 0.5x + 2$ over the intervals $0 \le x \le 1$, $1 \le x \le 2$, and $2 \le x \le 3$? Describe what you observe.

15. What is the average rate of change for the function $y = 0.5 \cdot 2^x$ over the intervals $0 \le x \le 1$, $1 \le x \le 2$, and $2 \le x \le 3$? Describe what you observe.

16. Reasoning Jonah invested $100 in an account. For any year t, the balance is given by the function $f(t) = 100 \cdot 1.12^t$. He created this table to see how the balance would grow in 6 years.

Time (years)	Initial Balance	1	2	3	4	5	6
Balance (dollars)	100	112	125				

a. Complete the table of balances *to the nearest dollar* for years 3–6.

b. Is the balance of the account represented by a linear function or an exponential function? Explain.

c. What would the balance be for each of the six years if the account increased at a constant rate of $12 each year? Would this be a wiser investment for Jonah? Explain.

Name _____ Class _____ Date _____

5.4 Practice

Form K

Exponential Growth and Decay

Identify the initial amount *a* and the growth factor *b* in each exponential function. (Hint: In the exponential equation $y = a \cdot b^x$, *a* is the initial amount and *b* is the growth factor when $b > 1$.)

1. $f(x) = 2 \cdot 3^x$

2. $y = 5 \cdot 1.06^x$

3. $g(t) = 6^t$

4. $h(x) = -3 \cdot 2^x$

Use the given function to find the balance in each account after the given period.

5. \$3000 principal earning 4% compounded annually, after 6 years
$f(x) = 3000 \cdot (1.04)^6$

6. \$2000 principal earning 6.8% compounded annually, after 3 years
$f(x) = 2000 \cdot (1.068)^3$

Find the balance in each account after the given period.

7. \$5000 principal earning 4% compounded annually, after 10 years

8. \$3500 principal earning 3.6% compounded annually, after 2 years

Identify the initial amount *a* and the decay factor *b* in each exponential function. (Hint: In the exponential equation $y = a \cdot b^x$, *a* is the initial amount and *b* is the *decay* factor when $b < 1$.)

9. $y = 4 \cdot 0.2^x$

10. $f(x) = 3 \cdot 0.9^x$

Tell whether the equation represents *exponential growth, exponential decay,* or *neither*.

11. $y = 2 \cdot 3^x$

12. $f(x) = 6 \cdot 0.5^x$

13. $f(x) = 5 \cdot x^2$

14. $y = 0.3^x$

Name _____ Class _____ Date _____

Practice (continued) *Form K*

Exponential Growth and Decay

15. The town manager reports that incoming revenues for a given year were \$2 million. The budget director predicts that revenues will increase by 4% per year. How much revenue will the town have available 10 years from the date of the town manager's report if the equation that models the growth is $f(x) = 2{,}000{,}000 \cdot (1.04)^x$?

16. A fisheries manager determines that there are approximately 3000 bass in a lake.

a. The population is growing at a rate of 2% per year. The function that models that growth is $y = 3000 \cdot 1.02^x$. How many bass will live in the lake after 4 years?

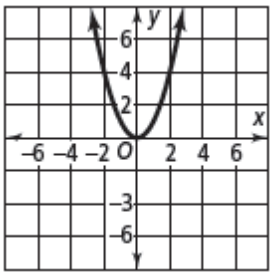
b. How many bass will live in the lake after 7 years?

c. About how long will it be before there are 4000 bass in the lake?

17. A business purchases a computer system for \$2000. The tax code allows them to take off a portion of that purchase for each year the computer system is used. If the value of the system is *depreciated* at a rate of 15% per year, the function that models the current value of the system is $f(x) = 2000 \cdot 0.85^t$. How much is the computer worth after 4 years?

Tell whether each represents an *exponential growth function*, an *exponential decay function*, or *neither*.

18.



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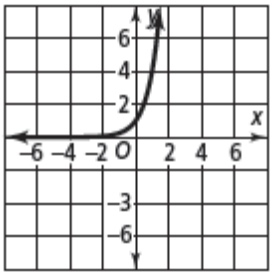

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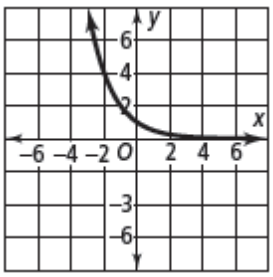

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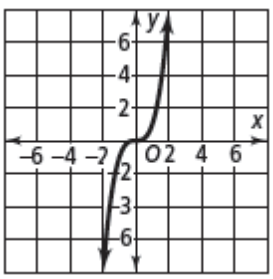


Name _____ Class _____ Date _____

5.5 Practice

Form K

Solving Exponential Equations

Solve each exponential equation.

1. $3^x = 27$

2. $5^{x-1} = 25$

3. $\frac{1}{64} = 4^x$

4. $2^{3x} = \frac{1}{64}$

5. $3^x = \frac{1}{81}$

6. $256 = 4^x$

7. $2^{x+2} = 16$

8. $\frac{1}{4} = 2^{x+2}$

9. $3^x = \frac{1}{9}$

10. $3^x = 81$

11. $6^x = 36$

12. $4^{x-1} = 16$

13. $4^{x+1} = 64$

14. $8^x = 512$

15. $\frac{1}{49} = \frac{1}{7^x}$

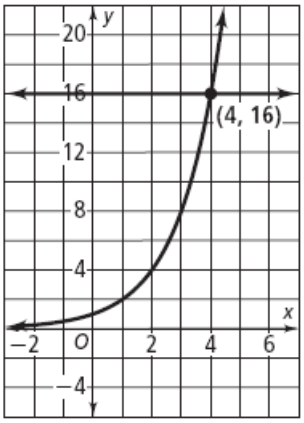
16. $7^{3x} = \frac{1}{343}$

Name _____ Class _____ Date _____

Practice (continued) *Form K*

Solving Exponential Equations

17. Use the graph to find the solution to the equation $4^{\frac{x}{2}} = 16$. Explain how you found your answer.



18. Video Views The number of views of a certain Internet video can be modeled by the function $V(n) = 3000 \cdot 3^n$, where n is the number of weeks since the video was posted. How many weeks will it take for the number of views to reach 729,000?

19. Error Analysis A student solved the exponential equation in the following way:

$$\frac{1}{7^x} = \frac{1}{343}$$
$$\frac{1}{7^x} = \frac{1}{7^3}$$
$$7^x = 7^{-3}$$
$$x = -3$$

What mistake did the student make? What is the correct solution?

Name _____ Class _____ Date _____

5.6 Practice

Form K

Geometric Sequences

Determine whether the sequence is a geometric sequence. Explain.

1. 1, 4, 16, 64, …

2. 108, 36, 12, 4, …

3. 5, 15, 25, 40, …

4. 75, 60, 48, 38.4, …

Find the common ratio for each geometric sequence.

5. 2, 8, 32, 128, …

6. 15, 150, 1500, 15,000, …

7. –2, –2, –2, –2, …

8. 243, 81, 27, 9, …

Write the explicit formula for each geometric sequence.

9. 3, 6, 12, 24, …

10. –1, –5, –25, –125, …

11. 140, 70, 35, 17.5, …

12. 12, –24, 48, –96, …

Write the recursive formula for each geometric sequence.

13. 1, 7, 49, 343, …

14. 5, 10, 20, 40, …

15. 512, 384, 288, 216, …

16. 8, –8, 8, –8, …

Name _____ Class _____ Date _____

Practice (continued) *Form K*

Geometric Sequences

Determine if each sequence is a geometric sequence. If it is, find the common ratio and write the explicit and recursive formulas.

17. 4, 16, 25, 36, …

18. 3, 12, 48, 192, …

19. 7, 11, 15, 19, …

20. –8, 16, –32, 64, …

Identify each sequence as arithmetic, geometric, or neither.

21. 1, 6, 11, 16, …

22. 125, 62.5, 31.25, 15.625 …

23. 1, 5, 10, 16, …

24. –5, 5, –5, 5, …

25. Biology A certain population of finches is decreasing by 6% every year. The current number of finches in the population is 456. Write the explicit and recursive formulas for the geometric sequence formed by the decrease in the number of finches.

26. Compare and Contrast Explain how a geometric sequence and an arithmetic sequence are the same. How are they different?

27. A geometric sequence is represented by the function $f(x) = 3 \cdot 2^{x-1}$. What is the initial value of the sequence and the common ratio? Find the first 4 terms of the sequence.

Math 1 Unit 5 Formulas

Average Rate of Change $m = \frac{y_2 - y_1}{x_2 - x_1}$

Amount with Interest added $A = P(1 + r)^t$

Geometric Explicit Formula $A(n) = (A(1))(r)^{n-1}$

Geometric Recursive Formula $A(1) = \_\_; A(n) = A(n-1)(r)$

Midpoint Formula $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$

Name: _____ Period: _____

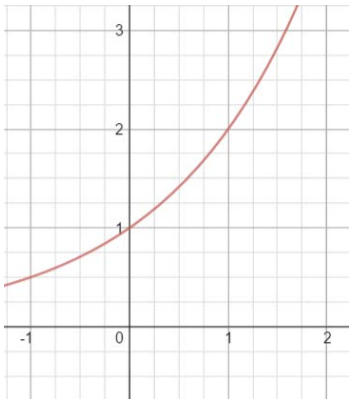
Math 1 Unit 5 Review

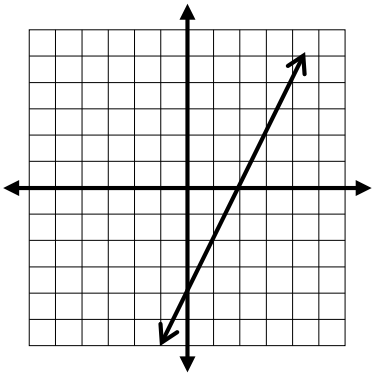
1. Evaluate $f(x) = 16(2)^x \ for\ x = -3$

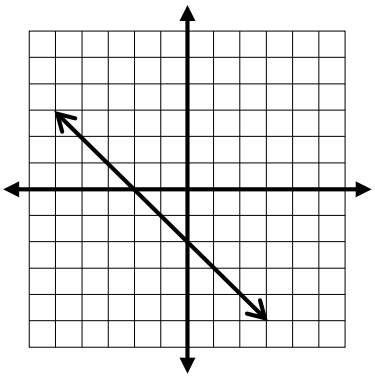
2. Re-write the expressions without a negative exponent. 8^{-1} 12^{-2} $\frac{1}{3^{-2}}$

3. Which expression(s) are equivalent to 1? 11^0 $\frac{2^{-3}}{3^{-2}}$ $\frac{1}{2^0}$

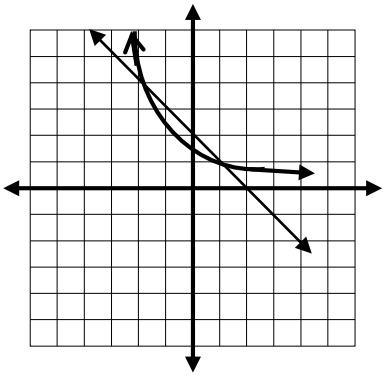
4. Write a reasonable equation for each graph shown below.







5. What values of x best represent where $f(x) = g(x)$ on the graph?



6. A student invests $400 at a rate of 8% interest per year. What amount of money will the student have after 2 years? After 5 years?

7. A population of endangered fish decreases exponentially and can be represented by the function $f(x) = 1200(.93)^x$. What is the percentage of the rate of decay?

8. Determine how many real solutions there are to the equation. Answers may be used more than once.

A. No Real Solutions B. One Real Solution C. Infinitely Many Real Solutions

1) $8^x = 64$ 1)_____

2) $2^x = -9$ 2)_____

3) $7^{2x} = 49^x$ 3) _____

4) $3^{x+1} = \left(\frac{1}{9}\right)$ 4)_____

9. For the following problem, choose if it was done correctly or at what step the error occurred.

Given: $3^{2x+1} = \frac{1}{2187}$

Step 1: $3^{2x+1} = 3^{-7}$

Step 2: $2x + 1 = 7$

Step 3: $x = 3$

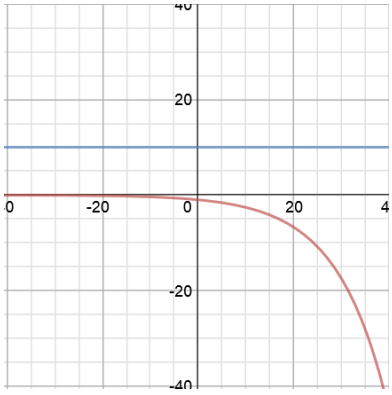
A. Step 1 is not correct.

B. Step 2 is not correct.

C. The solution is correct.

10. The following equation, $-2^x = 10$, was graphed by setting both sides of the equation equal to "y". What is the value of x?

A. Infinite Solution
B. No solution
C. $x = 10$
D. $x = -2$



11. Write the explicit formula for these geometric series:

4, 8, 16, 32 …

54, 18, 6, 2 …

12. $f(x) = 3\left(\frac{1}{4}\right)^x$ Find the correct range values for the given domain: $f(-2)$, $f(-1)$, $f(0)$, $f(2)$

13. What situations can be modeled by an exponential function:

    A) Matt is paid $15 an hour at his job

    B) Brandon pays about $300 per semester on books in college

    C) Adam invests $15,000 with 4% compounded quarterly interest

    D) Andrew drained his pool at a rate of 5 gallons per minute

    E) Steve's collection of insects is doubling every month

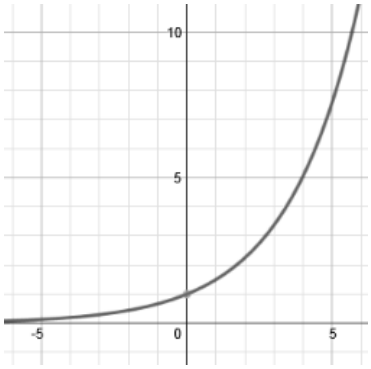
14. Choose all of the following that are situations that could be modeled by the graph:

    A) $f(x) = 1 \cdot \left(\frac{4}{3}\right)^x$

    B) The number of mice decreases by 90% every year

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

    D) $\frac{3}{4}$ of the plants die every season



15. How can you determine if a function is exponential growth or exponential decay?

    _____

    _____

16. Simplify the expression: $\frac{3^{-2}a^0b^8}{c^{-2}}$

17. Solve for x: $2^{x-3} = 8$

18. Consider the function $y = 25(0.2)^x$

    Find the range for the given domain $\{-2, -1, 0, 1, 2, \}$

    As the value of the domain increases, do the values of the range increase or decrease?

19. You borrow $7000 at a 2.5% annual interest rate.

A) Write the explicit form of a geometric sequence that models this situation

B) How much will you owe after 3 years?

C) How much will you owe after 10 years?

20. How does the graph of $f(x) = 3(8)^x + 2$ compare to the graph of $g(x) = 3(8)^x$? Use complete sentences to explain your answer.

_____

_____

_____

21. Using the table below, explain using complete sentences whether it represent a linear or exponential function?

X	1	2	3	4
Y	3	6	9	12

_____

_____

_____

Write the function for the data in the above table_____

22. Given the function $f(x) = (2)^x$ over the domain $0 \leq x \leq 6$. Find the average rate of change for the function over the intervals : $0 \leq x \leq 2$, $2 \leq x \leq 4$, and $4 \leq x \leq 6$

Create a table of values over the interval $0 \leq x \leq 6$

Domain	0	1	2	3	4	5	6
Range							

Find the average rate of change for each interval $0 \leq x \leq 2$ _____

$2 \leq x \leq 4$ _____

$4 \leq x \leq 6$ _____

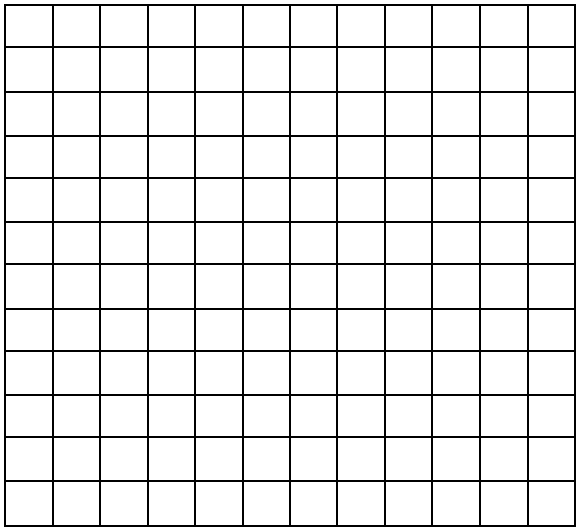
Contrast the average rate of change for the intervals and describe the changes using complete sentences

_____

_____

_____

23. Solve $.5^x = 4$ by graphing.



24. A family purchases a car for $20,000. The value of the car decreases about 20% each year. After 6 years the family decides to sell the car. Should they sell it for $4,000? Explain using complete sentences and mathematical reasoning.

_____

_____

_____

_____

25. Write the explicit and recursive formulas for each sequence:

14, 84, 504, 3024

Explicit formula_____ Recursive Formula_____

200, 100, 50, 25

Explicit formula_____ Recursive Formula_____