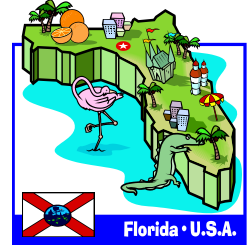## Day 7 Homework

1POPULATION

In 1990, Florida's population was about 13 million. Since1990, the state's population has grown about 1.7% each year. This means that Florida's population is growing exponentially.

| Year	Population
1990	
1991	
1992	
1993	
1994	

a) Write an explicit function in the form $y = ab^x$ that models the values in the table.

b) What does x represent in your function?

c) What is the "a" value in the equation and what does it represent in this context?

d) What is the "b" value in the equation and what does it represent in this context?

2 HEALTHCARE

Since 1985, the daily cost of patient care in community hospitals in the United States has increased about 8.1% per year. In 1985, such hospital costs were an average of $460 per day.

a) Write an equation to model the cost of hospital care. Let x = the number of years after 1985.

b) Find the approximate cost per day in 2012.

c) When was the cost per day $1000?
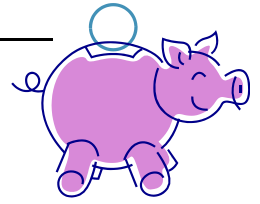

d) When was the cost per day $2000?
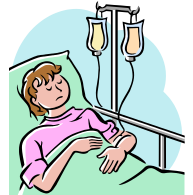
3HALF-LIFE

To treat some forms of cancer, doctors use Iodine-131 which has a half-life of 8 days. If a patient received 12 millicuries of Iodine-131, how much of the substance will remain in the patient 2 weeks later?

4 SAVINGS

Suppose your parents deposited $1500 in an account paying 6.5% interest compounded annually when you were born.

  a) Find the account balance after 18 years.

  b) When could you expect your account balance to double?

  c) What would be the difference in the balance after 18 years if the interest rate in the original problem was 8% instead of 6.5%?

  d) What would be the difference in the balance if the interest was 6.5% and was compounded monthly instead of annually.

5 HEALTH

Since 1980, the number of gallons of whole milk each person in the US drinks in a year has decreased 4.1% each year. In1980, each person drank an average of 16.5 gallons of whole milk per year.

Year	Population
1980	
1981	
1982	
1983	
1984	

a) Write a recursive function for the data in the table.

b) Write an explicit function in the form $y = ab^x$ that models the values in the table. Define your variables.

c)   According to this same trend, how many gallons of milk did a person drink in a year in 1970?

6 WASHINGTON, D.C.

The model $y = 604000(0.982)^x$ represents the population in Washington, D.C., x years after 1990.

  a) How many people were there in 1990?

  b) What percentage growth or decay does this model imply?

  c) Write a recursive function to represent the same model as the provided explicit function.

  d) Suppose the current trend continues, predict the number of people in DC in 2013.

  e) Suppose the current trend continues, in what year will the population of DC be approximately half what it was in 1990?

Day 8 Homework

Show your work using point ratio form.   Check in calculator! ☺

1. Carbon-14 decays slowly over several thousand years. When this isotope is formed, there is 50 grams of Carbon-14. Five thousand seven hundred and thirty years later there are 25 grams of Carbon-14.
    a. What percentage of the Carbon-14 is lost in 5730 years?

    b. What is the initial amount of Carbon-14?

    c. Write an equation to represent this situation.

    d. Use your equation from part c to predict how much Carbon-14 was present 1000 years after the formation of the isotope.

2. On old radio dials the numbers are not equally spaced, but they do have an exponential relationship. When the dial is tuned to 88.7 FM, it takes 6 "clicks" to tune to 92.9.
    a. Write an exponential model for the radio's tuning dial if x is the number of clicks past 88.7 and y is the radio station. Show your work.

    b. How many clicks would you need to turn the dial past 88.7 to tune to 106.3 FM?

3. The temperature of a bowl of ice water is measured at 23°C right after ice is added to it. Eight minutes later, its temperature is 14.02°C. Approximately how long will it take for the water to cool to 5°C?

4. The graph of an exponential function goes through the ordered pairs (-3, 0.32) and (2, 31.25).
    a. Write the explicit form of the exponential function.

    b. Write the recursive (NOW-NEXT) form of the exponential function.

    c. By what percentage are the range values increasing for each increase of 1 in the y-values?

Day 10 – Homework After Midterm ODM Test

Solving Radical Equations

Solve each equation. Check your answers for extraneous solutions.

1. $(2x + 1)^{1/2} - 2 = 2$	**2.** $\sqrt{x^2 - 9} + 3 = 7$
3. $(x - 2)^{1/3} - 3 = -5$	**4.** $10 - 3\sqrt[3]{2x + 5} = -11$
5. $(x^2 - x - 22)^{4/3} = 16$	**6.** $3(x - 5)^{3/2} - 6 = 18$
7. $\sqrt{2x - 6} = \sqrt{5x - 15}$	**8.** $\sqrt[3]{6x - 5} - \sqrt[3]{3x + 2} = 0$

Solve each equation. Remember to check for extraneous solutions.

1) $3 = \sqrt{b - 1}$

2) $2 = \sqrt{\dfrac{x}{2}}$

3) $\sqrt{-8 - 2a} = 0$

4) $\sqrt{x + 4} = 0$

5) $5 = \sqrt{r - 3}$

6) $\sqrt{2m - 6} = \sqrt{3m - 14}$

7) $\sqrt{8k} = k$

8) $\sqrt{9 - b} = \sqrt{1 - 9b}$

9) $\sqrt{3 - 2x} = \sqrt{1 - 3x}$

10) $\sqrt{3k - 11} = \sqrt{5 - k}$

11) $(20 - r)^{\frac{1}{2}} = r$

12) $(6b)^{\frac{1}{2}} = (8 - 2b)^{\frac{1}{2}}$

13) $\sqrt{56 - r} = r$

14) $\sqrt{-10 + 7p} = p$

16) $\sqrt{2v - 7} = v - 3$

15) $(18 - n)^{\frac{1}{2}} = \left(\dfrac{n}{8}\right)^{\frac{1}{2}}$

17) $-3 = (37 - 3n)^{\frac{1}{2}} - n$

18) $(-3 - 4x)^{\frac{1}{2}} - (-2 - 2x)^{\frac{1}{2}} = 1$

20) $2 = \sqrt{3b - 2} - \sqrt{10 - b}$

19) $x = 5 + (3x - 11)^{\frac{1}{2}}$

Homework Day 11

Part 1: Graph the following pairs of functions. For each graph, accurately indicate at least 3 points by completing the table then plotting the points on the grid. Then make a statement that compares the translated function to the parent function.

1) Parent function : y = 3ˣ
   Translated function : g(x) = 3ˣ + 2

X	y = 3ˣ	g(x) = 3ˣ + 2

2) Parent function : y = 2ˣ
   Translated function : h(x) =2ˣ⁺² -3

X	y = 2ˣ	h(x) = 2ˣ⁺² -3
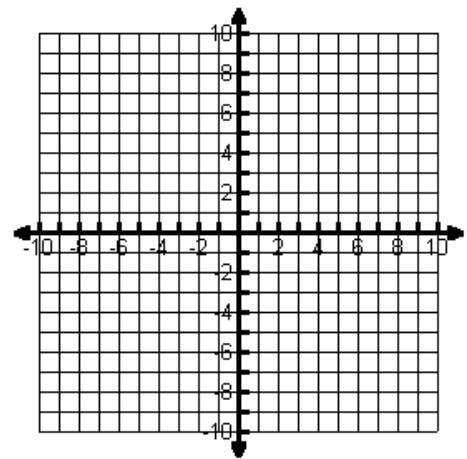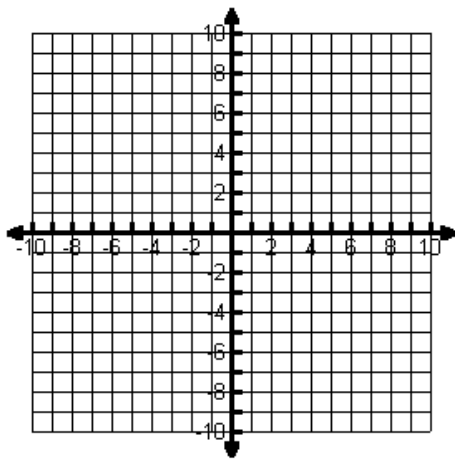
Comparison: _____

Comparison:_____

3) Parent function : y = 4ˣ
 Translated function : f(x) =4⁻ˣ

X	y = 4ˣ	g(x) = 4⁻ˣ
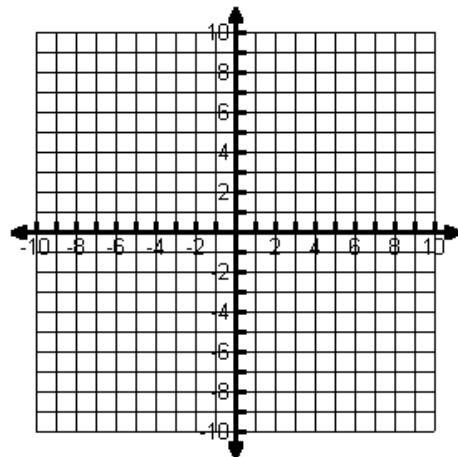
Comparison: _____

Explain how the graph is changed from the parent $y = 2^{(x)}$ and tell the horizontal asymptote.

4) $g(x) = 2^x + 2$ _____

5) $g(x) = 2^{-x} - 1$ _____

6) $g(x) = 2^{x-4} - 5$ _____

7) $g(x) = 2^{x+2} + 3$ _____

8) $g(x) = -2^x$ _____

9) $g(x) = 2^x - 4$ _____

Part 2: Find the inverses of the functions below. Graph the function and its inverse on graph paper.

1. $y = \dfrac{x+3}{3}$

2. $y = \frac{1}{2}x + 5$

3. $y = 2x + 5$

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

5. $f(x) = x^2 + 2$

6. $f(x) = x + 2$

7. $f(x) = 3(x + 1)$

8. $f(x) = -x^2 - 3$

9. The equation $f(x) = 198,900x + 635,600$ can be used to model the number of utility trucks under 6000 pounds that are sold each year in the U.S. with $x = 0$ representing the year 1992. Find the inverse of the function. Use the inverse to estimate in which year the number of utility trucks under 6000 pounds sold in the U.S. will be 4,000,000.

1. Describe in your own words what happens to the graph of f(x) = log(x) under the given transformations then graph by showing each step.

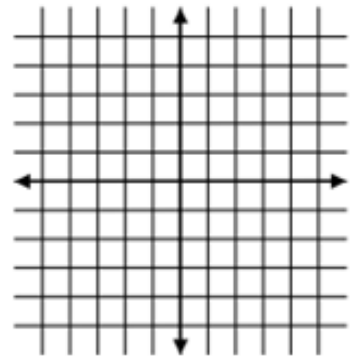   a. f(x) = log(x – 2)   b. f(x) = log(x) + 3   c. f(x) = log(x – 2) + 3
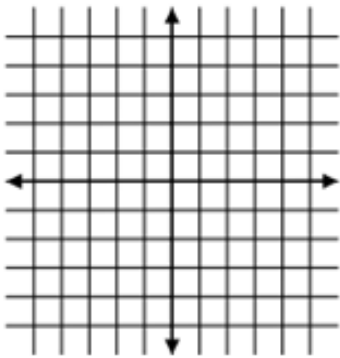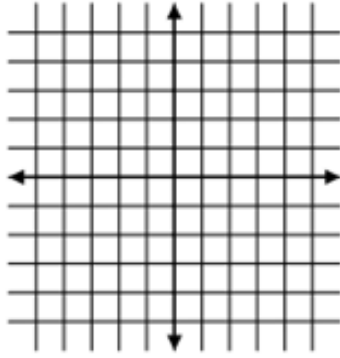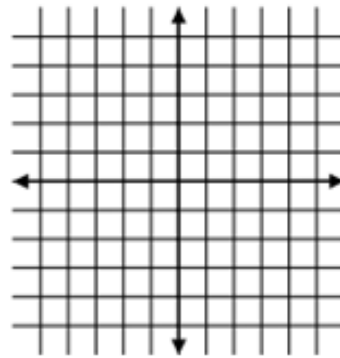
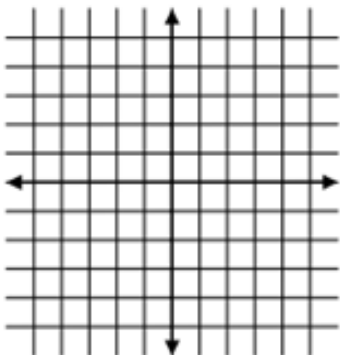   f(x) = log(x)   f(x) = log(x – 2)   f(x) = log(x) + 3   f(x) = log(x – 2) + 3

2. State the domain, range, intercepts and asymptotes of f(x) = log(x – 2) + 3.

_____

3. Describe in your own words what happens to the graph of f(x) = log(x) under the given transformations then graph f(x) = -log(x – 2).
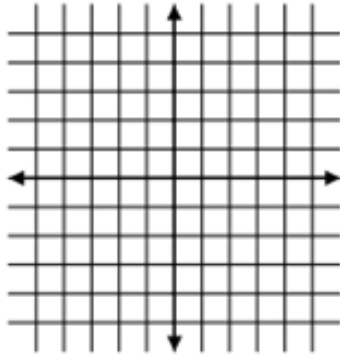
a. f(x) = -log(x)   b. f(x) = log(x – 2)   c. f(x) = -log(x – 2)
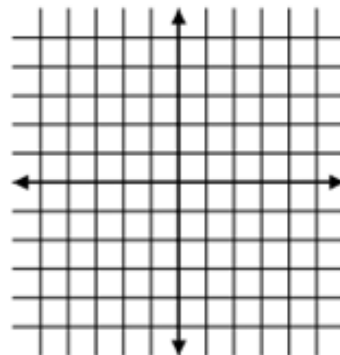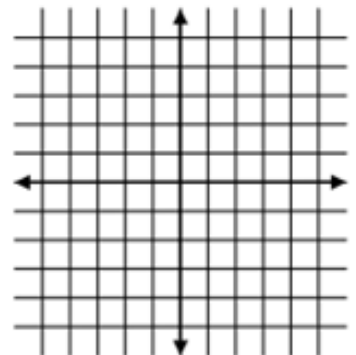

   f(x) = log(x)   f(x) = -log(x)   f(x) = log(x – 2)   f(x) = -log(x – 2)
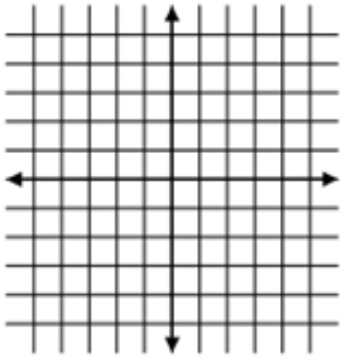
4. State the domain, range, intercepts and asymptotes of f(x) = -log(x – 2).

_____

5. Describe in your own words what happens to the graph of f(x) = log(x) under the given transformations then graph f(x) = log(-x) + 2.
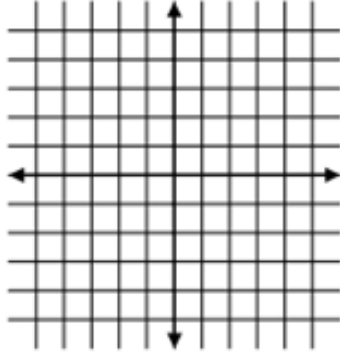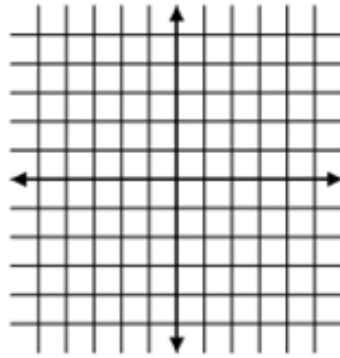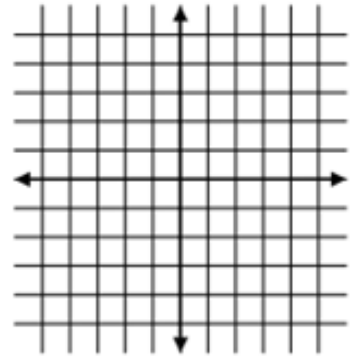   a.   f(x) = log(-x)   b. f(x) = log(x) + 2   c. f(x) = log(-x) + 2

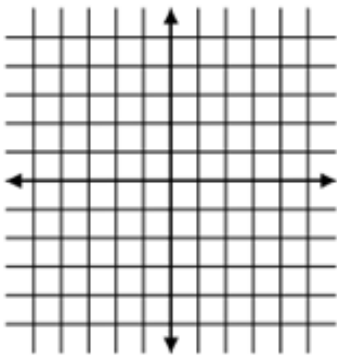f(x) = log(x)   f(x) = log(-x)   f(x) = log(x) + 2   f(x) = log(-x) + 2
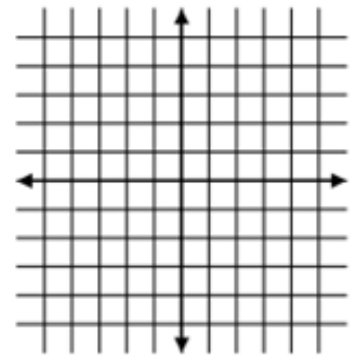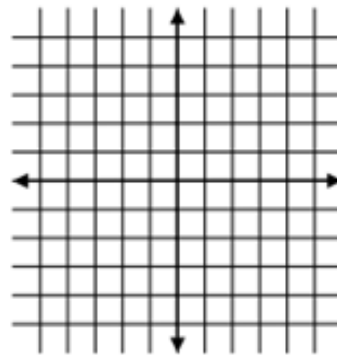
6. State the domain, range, intercepts and asymptotes of f(x) = log(-x) + 2.

_____

7. Graph f(x) = -log(-x) + 1.   Use the graphs below to show each transformation. Write the function of each step under each graph. (Hint: Look at graphs for #1 and #3)

   f(x) = log(x)   _____   _____   f(x) = -log(-x) + 1
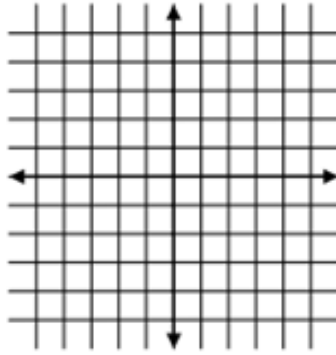
8. Graph f(x) = -log(x + 2) - 1.   Write the function of each step under each graph.

   f(x) = log(x)   _____   _____   _____

Homework Day 13

Logarithm Worksheet

HINT: See Packet p. 20 for a reminder of the "Log Loop" and how to change exponentials to logarithms (and vice versa)
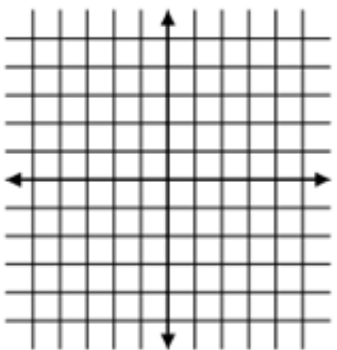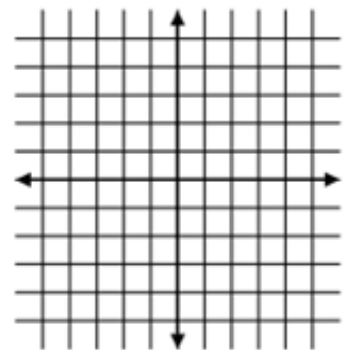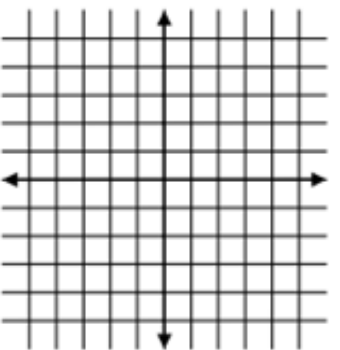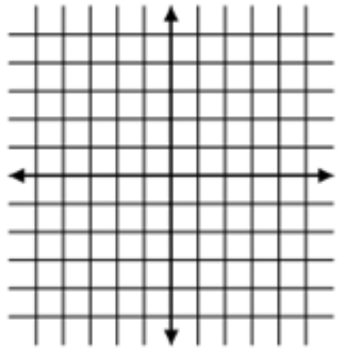
I. Evaluate the following and write as an exponential expression.

1. $\log 1000 = $_____

2. $\log 10 = $_____

3. $\log\ .001 = $_____

4. $\log\ 0.0001 = $_____

5. $\log \dfrac{1}{10,000} = $_____

6. $\log_{10} \dfrac{1}{100} = $_____

7. $\log\ 134 = $_____

8. $\log\ 0.15 = $_____

9. $\log\ 2700 = $_____

II. Change from exponential format to logarithmic format.

10. $5^3 = 125$ _____

11. $4^5 = 1024$_____

12. $3^7 = 2187$_____

13. $6^3 = \dfrac{1}{216}$ _____

14. $5^{-4} = \dfrac{1}{625}$ _____

15. $10^{-3} = 0.001$ _____

III. Change from logarithmic format to exponential format.

16. $\log_4 1024 = 5$ _____

17. $\log_2 \dfrac{1}{4} = -2$ _____

18. $\log_6 1296 = 4$ _____

19. $\log_3 \dfrac{1}{81} = -4$ _____

20. $\log_2 \dfrac{1}{512} = -9$ _____

21. $\log 100 = 2$ _____

Review of Logarithms

✓ A **logarithm** is an **exponent.**
✓ When you find the **"log"** of a number, you are finding an **exponent.**
✓ $\log_b x = y \Leftrightarrow b^y = x$

Remember

Logarithms and exponentials "undo" one another.

One way to remember how logarithm notation works is to consider the **"Logarithm Loop"** **diagram.**

$\log_2(64) = 6$ means that $2^6 = 64$

$\log_b(x) = y$ means that $b^y = x$, and the base number *b* will always be positive but not equal to 1.
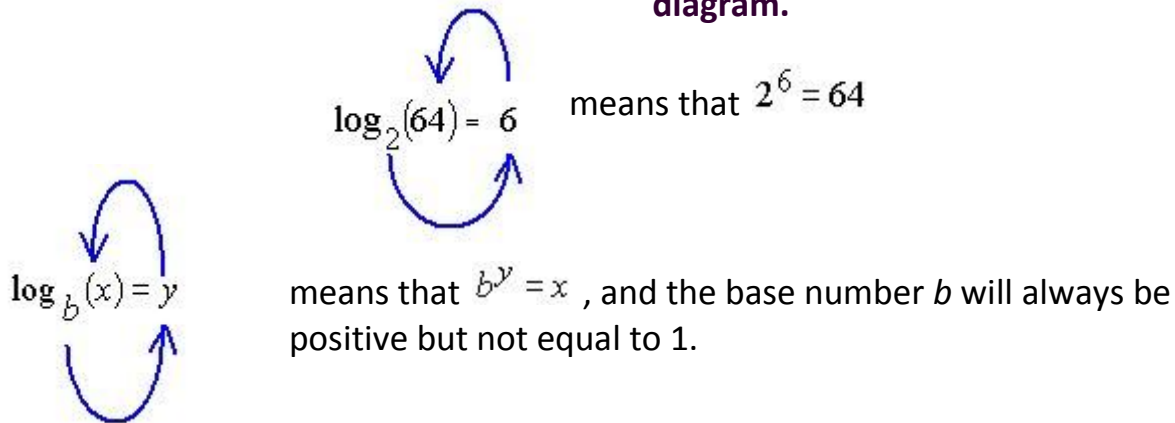
IV. Solve each equation. Round answers to four decimal places. Show all work algebraically! Use separate paper, if needed.

22. $4^{3x} = 12$ _____   23. $6^{x+2} = 18$ _____   24. $5^{3x-2} = 120$ _____

25. $2.4^{x+4} = 30$ _____   26. $9^{3x} = 4^{5x+2}$ _____   27. $2^{x+5} = 3^{x-2}$ _____

28. $5^{3b} = 106$ _____   29. $7^y = 15$ _____   30. $7.6^{d+3} = 57.2$ ___

Homework Day 14: Exponential Functions Test Review

Remember to show ALL your work! Use separate paper, if needed!

Simplify each expression, and write your final answer with rational exponents.

1) $\sqrt{36s^2} \cdot (s^6)^{1/3}$

2) $2k^{2/3} \cdot \frac{1}{4}k^{5/6}$

3) $x\sqrt[4]{16} \cdot 2^4 x$

Simplify each expression, and write your final answer in simplest radical form.

4) $m^{1/2} \cdot m^{4/3}$

5) $(12n^2 \cdot 24n^{1/4})^3$

6) $\sqrt[4]{256x^8} \cdot \sqrt{8x^3}$

7) Explain why $16^{13/4} = 16^3 \cdot \sqrt[4]{16}$ is a true statement.

8) Fill in the blank to make each statement true.

a. $2x^6 \cdot$____ $= 8x$

b. $(10x^{-3})/$____ $= 5x$

c. (____)$^2 = 32x^4$

d. (____)$^{-3} = 8m^9$

9) Write each expression in simplified radical form.

a. $\sqrt[5]{8m^2n^4} \cdot \sqrt[5]{20m^4n}$

c. $\sqrt[5]{k} \cdot k^{6/4}$

e. $-3\sqrt[4]{16y^9}$

b. $\sqrt{72} - \sqrt{75} + \sqrt{98}$

d. $\sqrt[\square]{81x^3y^6}$

f. $\sqrt[8]{(b-5)^2(b-5)^4}$ $^\square$

10) Explain how to calculate the value of $81^{3/4}$ without using a calculator.

11) Find the solution(s) for each of the following equations.

a. $2x^{\frac{4}{3}} - 2 = 160$

d. $\sqrt{2x+1} = -5$

g. $(2x+1)^{\frac{1}{3}} = 1$

b. $4x^{\frac{1}{2}} - 5 = 27$

e. $x^{1/6} - 2 = 0$

h. $x^{1/4} + 3 = 0$

c. $\sqrt{x+1} = x+1$

f. $\sqrt{x+2} = x - 18$

i. $\sqrt[8]{2x-4} = -2$

12) The function $y = 187900(1.025)^x$ represents the value of a home x years after purchase. Find the monthly and quarterly rate of appreciation of the home.

13) The function $y = 290,000(0.92)^x$ represents the value of an old home that has been abandoned by its owners x years ago. Find the decay rate of the old home.

14) Use the rules of exponents to find the value of x in each equation.

a. $(2^{x+1})^5 = 2^x$ b. $(3^{2x})(3^{16}) = 3^{48}$ c. $(5^{50})/(5^{40}) = 5^{x-5}$

15) Use your calculator to find the following logarithms.

a. $\log -100$ b. $\log 426$ c. $\log 100$ d. $\log (0.0001)$ e. $\log 3.45$

16) Use your knowledge of exponents and logarithms to solve these equations two ways.

a. $3(10^x) = 3,000$ b. $10^{2x-1} = 100$ c. $10^{2x} - 3 = 997$ d. $10^x = 1$

e. $-2(10)^{x+4} = -.002$ f. $10^{x/2} = 25$ g. $\frac{3}{2}(10)^{x+2} = 1500$ h. $3(10)^{x+4} + 3 = 15$

17) A 100 milligram sample of Carbon-10 has a half-life of 19.29 seconds. Write an exponential function to model its decay. Let x= time in minutes and $f(x)$ = the amount of Carbon-10 remaining in the sample.

18) Create a real world scenario that could be modeled by the function $f(x) = 40000 \cdot 0.95^x$. In your scenario, make sure to address percentage of exponential growth or decay and initial value.

19) A popular antique is gaining value because it is so hard to find. In 1985 its value was $125, and in 2000 its value was $1925.90.

      a. Find an explicit exponential function to model the information – show your work.

      b. Write a recursive (NOW-NEXT) function to model the data.

      c. Determine the percentage of yearly appreciation.

      d. If the same trend continues, how much was the antique worth in 2010?

Use what you know about solving exponential equations with base 10 to solve the following growth problem.

20) In a drop of pond water, there are 18 protozoa. Ten hours later, there are 180 protozoa in the dish. $P(t) = 18(10^{0.1t})$ provides an exponential growth model that matches these data points.

  a. Verify that the model $P(t) = 18(10^{0.1x})$ represents the information provided.

  b. Use the given function to estimate the time when the bacteria population would be expected to reach 500,000.

      i. Explain how to find the time by numerical or graph estimation.

      ii. Explain how to find the time by using common logarithms and algebraic reasoning.

  c. What is the theoretical domain of the function?

  d. What is the practical domain of the function?

  e. What is the range of the function?

  f. What are the intercepts of the function and what do they mean in the context of the problem?

  g. What are the intervals of increase and decrease on the practical domain? What do they mean in the context of the problem?

21) For the function $f(x) = (0.75)^x - 1$ evaluate the following:
a. f(-1) =   b. f(0) =   c. f(5) =   d. f(2) =

22)

Describe the effect on the graph when...	$y = a \cdot b^{x+c} + d$	$y = a \cdot \log (bx + c) + d$
a is negative		
a increases		
b increases		
c decreases		
d increases		

23) For each of the functions describe the key characteristics.

	$y = -2^{x+4} - 3$	$y = \log(x+2)$
Domain		
Range		
Asymptotes (if any)		
Zeros (if any)		
End behavior as x → ∞		
End behavior as x → -∞		
Sketch of the function		

25) Given the function $y = \frac{4}{x-3}$, answer the following questions.

    a. What is the inverse of the function?

    b. How can you verify algebraically that the functions are inverses?

    c. How can you verify graphically that the functions are inverses?

26) The following table gives some ordered pairs generated using the function g(x). Create a table containing points from $g^{-1}(x)$.
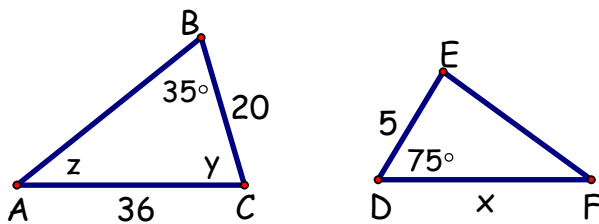
x	g(x)
4	-7
1	-4
0	3
-2	12

x	$g^{-1}(x)$

**Homework Day 15: Cumulative Review (After Test)**

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1. Given triangle ABC, with coordinate points A(1, 3) B(1, 6) C(-3, 1) find the coordinate points of the image and write the correct algebraic rule for each:

   a. Dilation by 2

   b. Rotation 90

   c. Rotation 180

   d. Reflection over the y-axis

   e. Reflections over y = -x

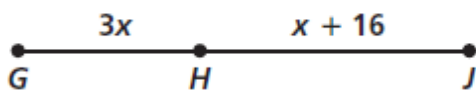2. Given $\triangle ABC \sim \triangle FED$ find all angle measures and side measures.

3. Given $\triangle PJG \sim \triangle PRQ$ find the values of x and y.

   $PJ = 6$
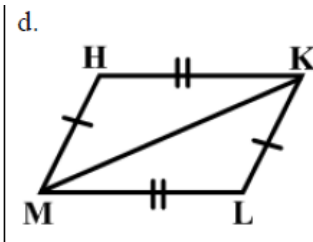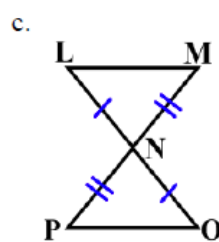 $JG = 5$
   $PG = 4$
   $GQ = x$
   $RQ = x + 6$
   $JR = y$
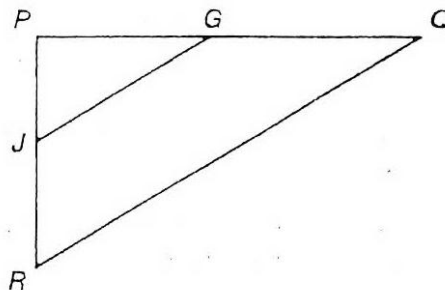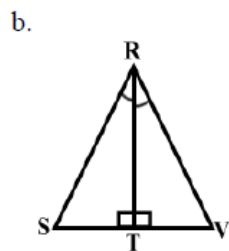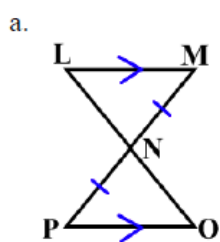
4. If GJ=27, what is the value of x?

5.

6. Describe a single transformation that has the same image as the composition of <6, 2> followed by <-2, -4>.

7. Can the following triangles be proven congruent? If so, write the congruency statement and which postulate proves them congruent.

8. Factor: $y = 3x^2 + 8x + 5$

9. Solve: $x^2 + 5x = -24$

10. Find the exact value of: $3x^2 + 7x - 23 = y$

11. Explain how you know if a quadratic will have 0, 1, or 2 solutions.

12. Explain how you know if a quadratic has real or imaginary solutions.

13. Explain the difference between rational and irrational.

14. What is the max height and the amount of time till the acorn hits the ground of the following:
$y = -16x^2 + 19x + 48$

15. Given the x-intercepts (0, 3) and (0, 7) and the vertex (5, -3), write the equation of the parabola.

16. Simplify the following expressions:

a. $(\sqrt[5]{25x^4})(\sqrt[5]{125x^3})$

b. $\sqrt[3]{64x^5 y^{10} z^{21}}$

17. Solve the following for the value of x: $\sqrt{x-5} - 12 = -8$

18. Find the inverse of $y = 3x + 6$

19. The value, V, of a tractor can be modeled by the function $V(t) = 20{,}000(0.84)^t$, where t is the number of years since the tractor was purchased. To the nearest hundredth of a percent, what is the monthly rate of depreciation?