Name: ______________________________ Per: _____

Algebra 2: 1st Semester Benchmark Exam

Example Sheet 3

Study Guide Problem & Solution		New Example
Which of the following conclusions is true about the statement? $-x^4 = \sqrt[4]{x}$ A. The statement is always true. C. It is true when $x = 0$. B. It is true when x is negative. D. The statement is never true. **TEST EACH CONCLUSION.** **A. IS IT ALWAYS TRUE?** **x=1:** $-(1)^4 = \sqrt[4]{(1)}$, $-1 = 1$ **NO!** **B. TRUE WHEN X IS NEG?** **x = –1:** $-(-1)^4 = \sqrt[4]{(-1)}$, $1 = 1i$ **NO!** **C. TRUE WHEN X=0?** $-(0)^4 = \sqrt[4]{(0)}$, $0 = 0$ **YES!** **THE ANSWER IS C.**	31	Which of the following conclusions is true about the statement? $x^{-2} = x^2$ A. The statement is always true. B. The statement is true when x is positive. C. The statement is true when x = -1, 0, or 1. D. The statement is never true.
Identify the axis of symmetry for the graph of $f(x) = 3x^2 + 12x + 4$. **THE AXIS OF SYMMETRY IS AT** $x = \frac{-b}{2a}$ **SO...** $x = \frac{-12}{2(3)} = \frac{-12}{6} = -2$ **AXIS OF SYMM. IS AT X = –2.**	32	Identify the axis of symmetry for the graph of $f(x) = 4x^2 + 20x + 7$.
On a recent test, Jorge wrote the equation $\frac{x^2-49}{x+7} = x - 7$. Which of the following statements is correct about the equation he wrote? A. The equation is always true. C. It is true when x = -7. B. The equation is always true, except when x = -7. D. The equation is never true. **FIRST, IDENTIFY ANYTHING THAT X CAN NEVER BE. THEN, SOLVE THE PROBLEM TO SEE HOW MANY SOLUTIONS THERE ARE (0, 1, INF.)** The denominator CAN'T be zero, so x + 7≠0. x≠7 $\frac{x^2-49}{x+7} = x - 7$ $x^2 - 49 = (x-7)(x+7)$ $x^2 - 49 = x^2 - 49$ **SINCE IT EQUALS ITSELF, B. THE EQUATION IS ALWAYS TRUE, EXCEPT WNEN X = –7.**	33	On a recent test, Sarah wrote the equation $\frac{3x+12}{x+4} = 3$. Which of the following statements is correct about the equation he wrote? A. The equation is always true. B. The equation is always true, except when x = -4. C. The equation is sometimes true when x = -4. D. The equation is never true.
Use inverse operations to write the inverse of $f(x) = x + \frac{2}{5}$ $x = f^{-1}(x) + \frac{2}{5}$ **FIRST, SWITCH THE X AND THE F(X).** $x = f^{-1}(x) + \frac{2}{5}$ **THEN, SOLVE FOR $F^{-1}(X)$!** $-\frac{2}{5}$ $-\frac{2}{5}$ $x - \frac{2}{5} = f^{-1}(x)$ → $f^{-1}(x) = x - \frac{2}{5}$ **IS THE INVERSE**	34	Use inverse operations to write the inverse of $f(x) = x - \frac{3}{4}$
Write the logarithmic equation $\log_3 27=3$ in exponential form. **BASE STAYS DOWN. SWITCH THE EXPONENT WITH THE PRODUCT.** $\log_3 27=3 \rightarrow 3^3=27$	35	Write the logarithmic equation $\log_5 25=2$ in exponential form.

Evaluate $\log_3 \frac{1}{81}$ by using mental math.

AS AN EXPONENT, IT WOULD BE: $3^? = \frac{1}{81}$

$3^? = \frac{1}{81} = \frac{1}{3^4} = 3^{-4}$ NEGATIVE EXPONENTS MAKE FRACTIONS, SO THE EXPONENT IS -4.

ANSWER: $\log_3 \frac{1}{81} = -4$

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Evaluate $\log_7 \frac{1}{49}$ by using mental math.

Simplify the expression $\log_6 216$.

$6^? = 216$

$? = 3$

$\log_6 216 = 3$

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Simplify the expression $\log_4 256$.

In 1995 the population of a small town was 450. If the annual rate of increase is about 0.4%, write an expression that represents the population 6 years later.

USE THE EXPRESSION $P(1 \pm R)^T$, WHERE P IS THE ORIGINAL AMOUNT, R IS THE RATE OF INCREASE OR DECREASE, AND T IS TIME.

P = 450, r = +0.4 (+ because it's an increase), and t = 6 years

$450(1+0.4)^6 \rightarrow 450(1.4)^6$

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In 1990 the population of a small town was 1000. If the annual rate of increase is about 0.6%, write an expression that represents the population 7 years later.

Determine whether f is an exponential function of x of the form $f(x) = ab^x$. If so, find the constant ratio.

x	-1	0	1	2	3
$f(x)$	0.525	4.2	33.6	268.8	2150.4

WRITE AN EXPONENTIAL FUNCTION OF THE TYPE $f(x) = ab^x$.
FIGURE OUT THE VALUE OF a AND b TO CREATE THE EQUATION.
THEN PLUG THE REMAINING POINTS IN TO SEE IF IT WORKS!

$f(x) = ab^x$ DETERMINE WHAT a IS BY

$4.2 = ab^0$ PLUGGING IN THE POINT (0, 4.2)

$4.2 = a(1)$

$4.2 = a$

DETERMINE WHAT b IS BY $33.6 = 4.2b^1$

PLUGGING IN $a = 4.2$ AND $33.6 = 4.2b$

THE POINT (1, 33.6) $8 = b$

NOW, YOU CAN CREATE YOUR EQUATION. $\rightarrow f(x) = 4.2(8)^x$

CHECK THAT THE EQUATION WORKS FOR x = -1, x = 2, AND x = 3.

$f(x) = 4.2(8)^1 = 0.525$ YES. NEXT... $f(x) = 4.2(8)^2 = 268.8$ YUP.

LAST ONE... $f(x) = 4.2(8)^3 = 2150.4$ IT WORKS!!

D. THE DATA SET IS EXPONENTIAL WITH A CONSTANT RATIO OF 8.

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Determine whether f is an exponential function of x of the form $f(x) = ab^x$. If so, find the constant ratio.

x	-1	0	1	2	3
$f(x)$	1.2	5.1	21.9	94.3	405.5

A. The second differences are not constant. The data set is not exponential.

B. The ratio of the successive first differences is constant. $f(x)$ is a linear function of x.

C. The data set is exponential with a constant ratio of 5.

D. The data set is exponential with a constant ratio of 4.3.

What is the solution to the equation $11^x = 2$?

A. $x = 9$ C. $x = \log_{10} 2 + \log_{10} 11$

B. $x = \frac{\log_{10} 2}{\log_{10} 11}$ D. $x = \log_{10} 9$

$11^x = 2$

$\log_{10} 11^x = \log_{10} 2$ THE EXPONENT MOVES TO THE

$x \log_{10} 11 = \log_{10} 2$ FRONT OF THE LOG.

$x = \frac{\log_{10} 2}{\log_{10} 11}$ DIVIDE BOTH SIDES BY $\log_{10} 11$ TO GET X ALONE

ANSWER: B

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What is the solution to the equation $7^x = 5$?

A. $x = 2$ C. $x = \log_{10} 5 + \log_{10} 7$

B. $x = \frac{\log_{10} 5}{\log_{10} 7}$ D. $x = \log_{10} 2$