Name: ____________________________ Date: _________

PCH: Review of Algebra 2 Log Topics Ms. Loughran

Do Now:

Solve each equation.

1. $2\log x + \log 5 = \log 125$

$\log 5x^2 = \log 125$

$5x^2 = 125$

$x^2 = 25$

$x = \cancel{\pm}5$

2. $\log(x+3) + \log(x-2) = \log(x-5) + \log(x+2)$

$\log(x^2+x-6) = \log(x^2-3x-10)$

$x^2+x-6 = x^2-3x-10$

$4x = -4$

$\cancel{x = -1}$

$\emptyset$

3. $\log(x-4) - \log(x+1) = \log 6$

$\log \frac{x-4}{x+1} = \log 6$

$\frac{x-4}{x+1} = 6$

$6x+6 = x-4$

$5x = -10$

$\cancel{x = -2}$

$\emptyset$

4. $\ln 3 - \frac{1}{3}\ln x = 0$

$\ln \frac{3}{x^{\frac{1}{3}}} = 0$

$e^0 = \frac{3}{x^{\frac{1}{3}}}$

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

$x = 27$

OR

$\ln 3 = \frac{1}{3}\ln x$

$\ln 3 = \ln x^{\frac{1}{3}}$

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

Properties of Logs

$$\log_b(m \cdot k) = \log_b m + \log_b k$$

$$\log_b\left(\frac{m}{k}\right) = \log_b m - \log_b k$$

$$\log_b m^k = k \log_b m$$

$\ln \rightarrow$ log whose base is e — natural log

$\log \rightarrow$ log whose base is 10 — common log

If $\log_b m = \log_b k \implies m = k$

Exponential Form

$a > 0, a \neq 1$

$a^b = c$ ← answer

b → power

a → base

Logarithmic Form

$a > 0, a \neq 1$

$b = \log_a c$ ← answer

b → power

a → base

b/c e^x and $\ln x$ are inverse functions

$$\begin{cases} \ln e^x = x \\ e^{\ln x} = x \end{cases}$$

ex. $\ln e^5 = 5$

exp. $e^{\ln 6} = 6$

5. $\log(x^2 - 21x) = 2$

*put it in exponential form

$10^2 = x^2 - 21x$

$100 = x^2 - 21x$

$0 = x^2 - 21x - 100$

$0 = (x-25)(x+4)$

$x = 25, -4$

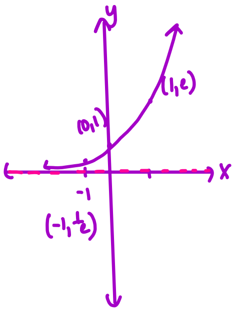
Classwork

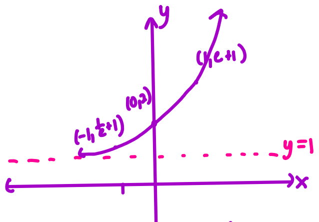
For each given function, state the domain and range, the equation of any asymptotes and the coordinates of any intercepts.

* $y = \ln(x-1)$ right 1

1. $y = e^x + 1$

$y = e^x$ ↑ 1

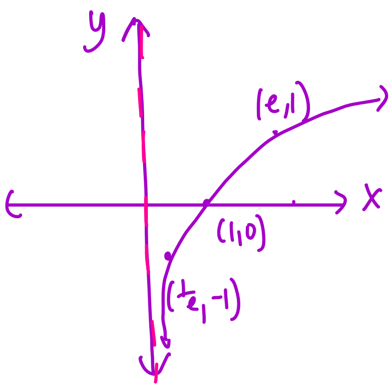


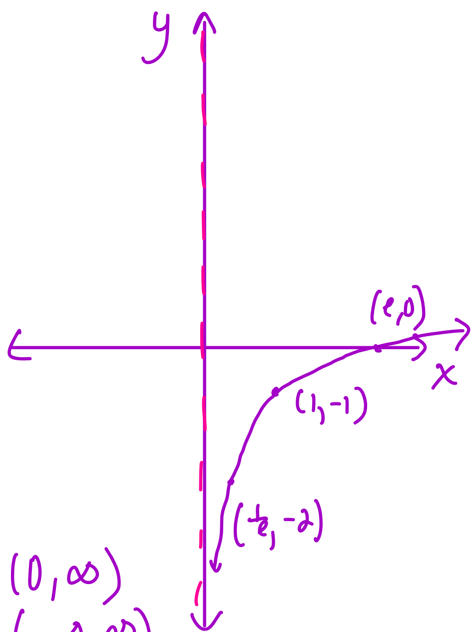


D: $(-\infty,\infty)$
R: $(1,\infty)$
x-int: none
y-int: $(0,2)$

5. $y = \ln x - 1$

$y = \ln x$ ↓1





* To find x-int: let y = 0

* To find y-int: let x = 0

D: $(0,\infty)$
R: $(-\infty,\infty)$
x-int $(e,0)$
y-int: none

9. If $\log n = 1 + \log 2$, then n is equal to:
(A) 12 (B) $\log 10 + \log 2$ (C) 2 (D) 20

$\log n - \log 2 = 1$

$\log \frac{n}{2} = 1$

$10^1 = \frac{n}{2}$

$n = 20$

$\log n = 1 + \log 2$

$\log n = \log 10 + \log 2$

$\log n = \log 20$

$n = 20$

means $8^{?} = 2$

10. If $x = (\log_8 2)(\log_2 8)$, find $\log_3 x$ without using your calculator.

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

$x = 1$

$\log_3 1 = 0$

11. Find the value of: a) $e^{\ln 5} = 5$ b) $10^{\log 5} = 5$

b/c 10^x and $\log x$ are inverse functions

12. $3^{\ln x} = 3^1$

$\ln x = 1$

$x = e^1$

$x = e$

14. $(\log_3 9)(\log_9 3) = x$

$(2)\left(\frac{1}{2}\right) = x$

$1 = x$

16. $(\log_3 9)(\log_9 81) = x$

$(2)(2) = x$

$4 = x$

18. $(\log_8 9)(\log_3 64)(\log_{27} 3) = x$

change of base

$\frac{\log 9}{\log 8} \cdot \frac{\log 64}{\log 3} \cdot \frac{1}{3} = x$

$\frac{\log 3^2}{\log 8} \cdot \frac{\log 8^2}{\log 3} \cdot \frac{1}{3} = x$

$\frac{2\cancel{\log 3}}{\cancel{\log 8}} \cdot \frac{2\cancel{\log 8}}{\cancel{\log 3}} \cdot \frac{1}{3} = x$

$\frac{4}{3} = x$

24. $\log_2(\log_3(\log_5 x)) = 0$

work from the outside in

$2^0 = \log_3(\log_5 x)$

$1 = \log_3(\log_5 x)$

$3^1 = \log_5 x$

$3 = \log_5 x$

$5^3 = x$

$125 = x$

26. Given that $\log 2 = a$ and $\log 3 = b$, find the following in terms of a and/or b.

(a) $\log 6$ (b) $\log \frac{2}{3}$ (c) $\log 12$ (d) $\log 1800$

(e) $\log \frac{1}{2}$ (f) $\log 5$ (g) $\log \frac{1}{3}$ (h) $\log 36$

a) $\log 6 = \log(2 \cdot 3) = \log 2 + \log 3 = a + b$

Classwork/ Homework 03-19

Log Sudoku

Name ____________________

Directions: Solve each problem and place the answer in the indicated row and column of the puzzle. When finished, solve the remaining Sudoku puzzle. Remember, each row, each column, and each 3x3 square should have the numbers 1 – 9, with no repetition.
Note: Only use the **positive, integer** solution in the puzzle.

	A	B	C	D	E	F	G	H	I
1	2	7	3	4	5	8	9	1	6
2	4	8	5	1	6	9	7	2	3
3	1	9	6	7	3	2	4	8	5
4	8	6	4	5	2	1	3	9	7
5	3	5	2	9	8	7	1	6	4
6	7	1	9	6	4	3	8	5	2
7	9	3	8	2	7	5	6	4	1
8	5	4	7	8	1	6	2	3	9
9	6	2	1	3	9	4	5	7	8

1. Evaluate for a: $\log_a 1296 = 4$ — $a^4 = 1296$, $a = 6$ — A - 9 — $a = 6$
2. Solve: $\log_4(x + 11) = 2$ — $4^2 = x + 11$, $x = 5$ — G - 9 — $x = 5$
3. Evaluate $\log_{25} 25 = x$ — $25^x = 25$ — A - 3 — $x = 1$
4. Evaluate $\log_5 625 = x$ — $5^x = 625$, $x = 4$ — H - 7 — $x = 4$
5. Solve: $\log_7(7x – 3) = \log_7(5x + 15)$ — $7x - 3 = 5x + 15$, $2x = 18$, $x = 9$ — A - 7 — $x = 9$
6. Solve: $\log_3(14 – x) = 2$ — $9 = 14 - x$, ~~x=5~~ — E- 1 — $x = 5$
7. Identify x: $8^2 = 64 \longrightarrow \log_a b = x$ — G - 8 — $x = 2$
8. Evaluate for a: $\log_a(1/343) = -3$ — $a^{-3} = \frac{1}{343}$, $a^3 = 343$ — I - 4 — $a = 7$
9. Solve $\log_9(x + 3) = \log_9 2x$ — $x + 3 = 2x$ — D- 9 — $x = 3$
10. Evaluate for x: $\ln e = x$ — D - 2 — $x = 1$
11. Evaluate for a: $\log_a 512 = 3$ — $a^3 = 512$ — H - 3 — $a = 8$
12. Evaluate $\log_{15} 225 = x$ — $15^x = 225$ — D- 7 — $x = 2$
13. Find x: $\log x = (1/3)\log 64$ — $\log x = \log 64^{\frac{1}{3}}$ — B - 8 — $x = 4$
14. Identify x: $x^4 = 16 \longrightarrow \log_2 16 = 4$ — C- 5 — $x = 2$
15. In the following expansion, identify m: $\log_5(mx^3) = ½ \log_5 64 + 3\log_5 x$ — C - 7 — $m = 8$

$\log_5 mx^3 = \log_5 8x^3$

$m = 8$

Name:________________________________ Date:________

PCH: Even More Solving Radical Equations Ms. Loughran

Do Now:

Solve for x.

1. $\sqrt{x^2-6x}=x-\sqrt{2x}$

$\cancel{x^2}-6x=\cancel{x^2}-2x\sqrt{2x}+2x$

$-8x=-2x\sqrt{2x}$

$4x=x\sqrt{2x}$

$16x^2=(2x)x^2$

$16x^2=2x^3$

$0=2x^3-16x^2$

$0=2x^2(x-8)$

$x=0 \quad | \quad x=8$

$x^2-6x\geq 0$

$x(x-6)\geq 0$

0 6

$x\geq 0$

$4x\geq 0$

$x\geq 0$

$x-\sqrt{2x}\geq 0$

$-\sqrt{2x}\geq -x$

$\sqrt{2x}\leq x$

$2x\leq x^2$

$0\leq x^2-2x$

$x^2-2x\geq 0$

0 2

$\therefore x\geq 6,\ x=0$

Classwork:

Solve for x.

1. $x\sqrt{4-x}-\sqrt{9x-36}=0$

$4-x\geq 0$

$-x\geq -4$

$x\leq 4$

$9x-36\geq 0$

$x\geq 4$

$\therefore x=4$

$x\sqrt{4-x}=\sqrt{9x-36}$

$x^2(4-x)=9x-36$

$4x^2-x^3=9x-36$

$0=x^3-4x^2+9x-36$

$0=x^2(x-4)+9(x-4)$

$0=(x^2+9)(x-4)$

$| \ x=4$

2. $\sqrt{x-7}+\sqrt{x+9}=8$

$x\geq 7,\ x\geq -9$

$-x-31\geq 0$

$-x\geq 31$

$x\leq 31$

$\therefore [7,31]$

$x-7+x+9+2\sqrt{x^2+2x-63}=64$

$2x+2+2\sqrt{x^2+2x-63}=64$

$+2\sqrt{x^2+2x-63}=62-2x$

$\sqrt{x^2+2x-63}=-x+31$

$\cancel{x^2}+2x-63=\cancel{x^2}-62x+31^2$

$64x=1024$

$x=16$

$\sqrt{x-7} > \sqrt{x}$

if $x>0$ this is impossible

$x \geq 0$

$x-7 \geq 0$

$x \geq 7$

$x-4 \geq 0$

$x \geq 4$

3. $\sqrt{x-7}-\sqrt{x}=1$

$x-7+x-2\sqrt{x^2-7x}=1$

$\cancel{0}$

$-2\sqrt{x^2-7x}=-2x+8$

$\sqrt{x^2-7x}=x-4$

$x^2-7x=x^2-8x+16$

$x=16$

$x-1 \geq 0$

$x \geq 1$

$2x-11 \geq 0$

$x \geq \frac{11}{2}$

4. $\sqrt{x-1}-\sqrt{2x-11}=0$

$\sqrt{x-1}=\sqrt{2x-11}$

$x-1=2x-11$

$10=x$

$x \geq -2$

$2x-5 \geq 0$

$x \geq \frac{5}{2}$

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

$x+2=2x-5$

$7=x$

$\sqrt{4x+5}-\sqrt{x+5} \geq 0$ automatically true if

$x \geq -\frac{5}{4}$ $\quad x \geq -5$

$x \geq 2$

$2x+6 \geq 0$

$x \geq -3$

6. $\sqrt{4x+5}-\sqrt{x+5}=\sqrt{x-2}$

$4x+5+x+5-2\sqrt{(4x+5)(x+5)}=x-2$

$-2\sqrt{4x^2+25x+25}=-4x-12$

$\sqrt{4x^2+25x+25}=2x+6$

$\cancel{4x^2}+25x+25=\cancel{4x^2}+24x+36$

$x=11$

$\sqrt{x+4}+\sqrt{2x-1} \geq 0$ automatically true if

$2x-1 \geq 0$

$x \geq \frac{1}{2}$

$x \geq -4$

$x \geq \frac{1}{2}$

$7x+1 \geq 0$

$x \geq -\frac{1}{7}$

7. $\sqrt{x+4}+\sqrt{2x-1}=\sqrt{7x+1}$

$x+4+2x-1+2\sqrt{(x+4)(2x-1)}=7x+1$

$3x+3+2\sqrt{2x^2+7x-4}=7x+1$

$+2\sqrt{2x^2+7x-4}=4x-2$

$\sqrt{2x^2+7x-4}=+2x-1$

$2x^2+7x-4=4x^2-4x+1$

$0=2x^2-11x+5$

$0=(2x-1)(x-5)$

$x=\frac{1}{2},5$

$x>0$

$6-2x \geq 0$

$-2x \geq -6$

$x \leq 3$

8. $2\sqrt{x}+1=\dfrac{6}{\sqrt{x}}$

$2x+\sqrt{x}=6$

$\sqrt{x}=6-2x$

$x=4x^2-24x+36$

$0=4x^2-25x+36$

$0=(4x-9)(x-4)$

$x=\frac{9}{4}$ $\quad \cancel{x=4}$