

Worksheet 4.2

1. $\log_6 36 = 2$

2. $3^3 = 27$

3. $y = \log_3 x$

4. 1.8295

5. $\ln \frac{x^2 \sqrt{y}}{zw^3}$

6. a. I, IV

b. I, II

7. $\{3\}$

8. $\{5\}$

9. $\{-2\}$

10. $\{-\frac{2}{3}\}$

11. $\{4\}$

12. ~~$\{3\}$~~ $\{3\}$

13. $\{2.833\}$

14. $\{.685\}$

15. $\{-.201\}$

16. $\{.616\}$

17. $\{2.116\}$

Test on Monday

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17) $4^{x-3} = 3^{1-x}$

$$(x-3)\log 4 = (1-x)\log 3$$

$$x\log 4 - 3\log 4 = \log 3 - x\log 3$$

$$x\log 4 + x\log 3 = \log 3 + 3\log 4$$

$$x(\log 4 + \log 3) = \log 3 + 3\log 4$$

$$x = \frac{\log 3 + 3\log 4}{\log 4 + \log 3} \approx 2.116$$

~~$2x\log 4 + x\log 4$~~

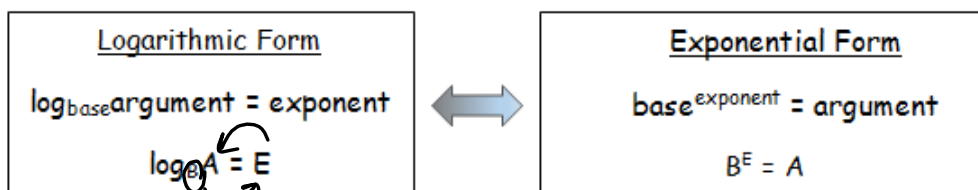
5)

$$2\ln x + \frac{1}{2}\ln y - \ln z - 3\ln w$$

$$\frac{\ln x^2 + \ln \sqrt{y} - \ln z - 3\ln w}{-1(\ln z + 3\ln w)}$$

$$\ln x^2 \sqrt{y} - \ln zw^3$$

$$\rightarrow \ln \frac{x^2 \sqrt{y}}{zw^3}$$



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Steps:

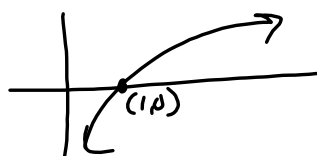
1. Use the laws of logs to combine. squish

2. a. Log on both sides → set arguments equal

b. Log on one side → change to exponential form

3. Solve for variable.

4. "Look check" at original equation (Can't take the log of a negative number or 0).



$$\log _ = \log _$$

$$\log(B) = _$$

$$\log^{\text{+ #s}} x = y$$

Domain $\{x \mid x > 0\}$
 Base > 0

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Solve.

~~$\log(x-1)$~~

1. $\log 3 + \log x = \log 12$

~~$\log 3x = \log 12$~~

$3x = 12$

$x = \{4\}$

Check ✓

2. $\log_4 x + \log_4 (x-6) = 2$

~~$\log_4 x(x-6) = 2$~~

$x^2 - 6x = 4^2$

$x^2 - 6x = 16$

$x^2 - 6x - 16 = 0$

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

$x=8 \mid x=-2$
Check reject
 $\{8\}$

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3. $2\log_3 x - \log_3 (x-2) = 2$

$\log_3 x^2 - \log_3 (x-2) = 2$

~~$\log_3 \frac{x^2}{x-2} = 2$~~

~~$\frac{9x^2}{1} = \frac{x^2}{x-2}$~~

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

$9x - 18 = x^2$

$x^2 - 9x + 18 = 0$

$(x-6)(x-3) = 0$

$x=6 \mid x=3$ $\{3, 6\}$

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

$\log(x-2)(2x-3) = \log x^2$

$\frac{2x^2 - 3x - 4x + 6}{-x^2} = \frac{x^2}{-x^2}$

$x^2 - 7x + 6 = 0$

$(x-6)(x-1) = 0$

$x=6 \mid x=1$
reject

$\{6\}$

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5. ~~$\log(x^2 - 8) = \log 1$~~

$$\begin{aligned} x^2 - 8 &= 1 \\ \sqrt{x^2} &= \sqrt{9} \\ x &= \pm 3 \\ \text{check } \checkmark \\ \{ \pm 3 \} \end{aligned}$$

6. $\log_5 5 = -\frac{1}{3}$

~~$$\begin{aligned} x^{-1/3} &= 5 \\ \left(\frac{1}{x}\right)^{1/3} &= 5 \\ \left(\sqrt[3]{\frac{1}{x}}\right)^3 &= (5)^3 \\ \frac{1}{\sqrt[3]{x}} &= 5 \\ \frac{1}{\sqrt[3]{x}} &= 5 \\ \frac{1}{x} &= \frac{125}{1} \\ 125x &= 1 \\ x &= \frac{1}{125} \end{aligned}$$~~

$$\begin{aligned} x^{1/3} &= \sqrt[3]{x} \\ (x^{-1/3})^{-3} &= (5)^{-3} \\ x' &= \left(\frac{1}{5}\right)^3 \\ x &= \frac{1}{125} \end{aligned}$$

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7. $4\log_2 x + \log_2 5 = \log_2 405$

$$\log_2 x^4 + \log_2 5 = \log_2 405$$

$$\log_2 5x^4 = \log_2 405$$

$$\frac{5x^4}{5} = \frac{405}{5}$$

$$\sqrt[4]{x^4} = \sqrt[4]{81}$$

$$x = \pm 3$$

reject -3

$$\{ 3 \}$$

8. $\ln 2 + \ln x = 3$

$$\ln 2x = 3$$

$$\frac{e^3}{2} = \frac{2x}{2}$$

$$x = \frac{e^3}{2} \approx 10.043$$

ln (loge)

$$\ln(2x) \neq \ln 2 \cdot x$$

$$\ln(2x) = \ln 2 + \ln x$$

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9. $\log(x+3) + \log x = 1$

$$\log x(x+3) = 1$$

$$10^1 = x^2 + 3x$$

$$x^2 + 3x - 10 = 0$$

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

$$\cancel{x=-5} \mid x=2$$

reject

$$\log(-5+3)$$

$$\{2\}$$

10. $\log_2(4x+10) - \log_2(x+1) = 3$

$$\log_2 \frac{4x+10}{x+1} = 3$$

$$\frac{8 \cdot 2^3}{1} = \frac{4x+10}{x+1}$$

$$8x+8 = 4x+10$$

$$4x = 2$$

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

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