

Worksheet 4.2

1. $\log_6 36 = 2$	7. $\{3\}$	13. $\{2.833\}$
2. $3^3 = 27$	8. $\{5\}$	14. $\{.685\}$
3. $y = \log_3 x$	9. $\{-2\}$	15. $\{-20\}$
4. 1.8295	10. $\{-\frac{2}{3}\}$	16. $\{.616\}$
5. $\ln \frac{x^2 \sqrt{y}}{zw^3}$	11. $\{4\}$	17. $\{2.116\}$
6. a. I, IV	12. $\{3\}$	
b. I, II		

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<u>Logarithmic Form</u> $\log_{\text{base}} \text{argument} = \text{exponent}$ $\log_b A = E$	$\longleftrightarrow$	<u>Exponential Form</u> $\text{base}^{\text{exponent}} = \text{argument}$ $B^E = A$
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Steps:

1. Use the laws of logs to combine.
2. a. Log on both sides $\rightarrow$ set arguments equal
b. Log on one side $\rightarrow$ 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).

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Solve.

1. $\log 3 + \log x = \log 12$
 $\log(3x) = \log 12$
 $3x = 12$
 $x = 4$
 $\log(3) + \log(4) = \log 12$
 $\log 12 = \log 12 \checkmark$
2. $\log_4 6 + \log_4(x-6) = 2$
 $\log_4 x(x-6) = 2$
 $4^2 = x(x-6)$
 $16 = x^2 - 6x$
 $x^2 - 6x - 16 = 0$
 $(x-8)(x+2) = 0$
 $x = 8$ (reject)
 $x = -2$ (reject)

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3. $\log_3 x - \log_3(x-2) = 2$
 $\log_3 \frac{x}{x-2} = 2$
 $\frac{x}{x-2} = 3^2 = 9$
 $x = 9(x-2)$
 $x = 9x - 18$
 $-8x = -18$
 $x = \frac{18}{8} = \frac{9}{4}$
 $x = 2.25$
4. $\log(x-2) + \log(2x-3) = \log x^2$
 $\log(x-2)(2x-3) = \log x^2$
 $2x^2 - 3x - 4x + 6 = x^2$
 $x^2 - 7x + 6 = 0$
 $(x-6)(x-1) = 0$
 $x = 6$ (reject not in domain)
 $x = 1$

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5. $\log_5(x^2 - 8) = \log 1$
 $x^2 - 8 = 1$
 $x^2 = 9$
 $x = \pm 3$
 $\log(3^2 - 8) = \log 1$
 $\log 1 = \log 1$
6. $\log_5 5 = -\frac{1}{3}$
 $5^{-1/3} = 5$
 $\frac{1}{5^{1/3}} = 5$
 $\frac{1}{\sqrt[3]{5}} = 5$
 $\sqrt[3]{x} = \frac{1}{5}$
 $(\sqrt[3]{x})^3 = (\frac{1}{5})^3$
 $x = \frac{1}{125}$

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

$x(5) = 109, 405$

$5x^4 = 405$

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

$x^4 = 81$

$x = 81^{\frac{1}{4}}$

$4\sqrt{x} = 81$

$x = 3$

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

$\ln(2x) = 3$

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

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

$\frac{e^3}{2}$ exact

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

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

$10 = x(x+3)$

$10 = x^2 + 3x$

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

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

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

$x = -5$ $x = 2$

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

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

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

$8(x+1) = 4x+10$

$8x+8 = 4x+10$

$-4x-8 = -4x-8$

$4x = 2$

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

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