Property of Equality: If $\log_x a = \log_x b, then\ a = b.$

1. Condense each side, if necessary.
2. Use the Property of Equality to solve the equation.
3. If it is a quadratic equation, you will need to factor to solve.
4. Be sure to go back and check your answer(s) in the expressions.
5. The expressions cannot be a zero or a negative.

1. $\log_3(x^2 + 3x) = \log_3(x + 15)$

$x^2+3x = x+15$

$-x-15 \quad -x-15$

$x^2+2x-15 = 0$

$(x+5)(x-3)=0$

$x=-5 \quad x=3$

check: $(-5)^2+3(-5)$ — positive answer

10 ✓

$3^2+3(3)$

18 ✓

2. $\log_3(x+5) + \log_3(x-2) = \log_3 18$

$\log_3[(x+5)(x-2)] = \log_3 18$

$x^2+3x-10 = 18$

$-18 \quad -18$

$x^2+3x-28 = 0$

$(x+7)(x-4)=0$

$x=-7 \quad x=4$

check: $-7+5$, -2 — Not positive

3. $\log_6 x = \frac{1}{2}\log_6 9 + \frac{1}{3}\log_6 27$

$\log_6 x = \log_6 9^{1/2} + \log_6 27^{1/3}$

$\log_6 x = \log_6 \sqrt{9} + \log_6 \sqrt[3]{27}$

$\log_6 x = \log_6 3 + \log_6 3$ ← multiply

$\log_6 x = \log_6 9$

$x = 9$

Logarithmic Equations – CW
Algebra II with Support

Name:

Property of Equality: If $\log_x a = \log_x b$, then $a = b$.

1. Condense each side, if necessary.
2. Use the Property of Equality to solve the equation.
3. If it is a quadratic equation, you will need to factor to solve.
4. Be sure to go back and check your answer(s) in the expressions.
5. The expressions cannot be a zero or a negative.

1. $\log_3(2x-6) = \log_3 x$

$2x-6 = x$
$-6 = -x$
$6 = x$ ✓

2. $\log(-3b+7) = \log(-2b+7)$

$-3b+7 = -2b+7$
$+3b \quad +3b$
$7 = b+7$
$0 = b$ ✓

3. $\log_{19}(8x+3) = \log_{19}(x^2+15)$

$8x+3 = x^2+15$
$0 = x^2-8x+12$
$0 = (x-6)(x-2)$
$x=6$ ✓ $x=2$ ✓

4. $\log_{17}(9-n) = \log_{17}(n^2+7n)$

$9-n = n^2+7n$
$0 = n^2+8n-9$
$0 = (n+9)(n-1)$ $n=1$ $n=-9$

5. $\log_7 x + \log_7(x+72) = \log_7 73$

$x^2+72x = 73$
$x^2+72x-73=0$
$(x+73)(x-1)=0$
$x=-73$ $x=1$ ✓

6. $\log 5x^2 - \log 9 = \log 5$

$\frac{5x^2}{9} = 5$
$5x^2 = 45$
$x^2 = 9$
$x=3$ ✓ $x=3$ ✓

7. $\log_6(x+2) + \log_6 x = \log_6 63$

$x^2+2x = 63$
$x^2+2x-63=0$
$(x+9)(x-7)=0$
$x=-9$
$x=7$ ✓

8. $\log_3(x+5) - \log_3 x = \log_3 58$

$\frac{x+5}{x} = 58$
$x+5 = 58x$
$5 = 57x$
$x = \frac{5}{57}$

9. $\log_7 x = 3\log_7 5$

$\log_7 x = \log_7 5^3$
$x = 125$

10. $\log_2 x + 3\log_2 2 = \log_2 64$

$\log_2 x + \log_2 2^3 = \log_2 64$
$\log_2 8x = \log_2 64$
$8x = 64$
$x = 8$

Logarithmic Equations
Algebra II with Support

Name:

Solve each equation.

1. $\log_5(3x-7) = \log_5(7x-21)$

$3x-7=7x-21$
$14=4x$
$\frac{14}{4}=x$
$\frac{7}{2}=x$ ✓

2. $\log_6(4x+4) = \log_6 64$

$4x+4=64$
$4x=60$
$x=15$

3. $\log_5 x = 4\log_5 3$

$x=3^4$
$x=81$ ✓

4. $\log_3(x^2+3x) = \log_3(x+15)$

$x^2+3x=x+15$
$x^2+2x-15=0$
$(x+5)(x-3)=0$ $x=-5$ ✓ $x=3$ ✓

5. $\log_9(5x) = \log_9 6 + \log_9(x-2)$

$5x=6x-12$
$-x=-12$
$x=12$ ✓

6. $\log_6 x = \frac{1}{2}\log_6 9 + \frac{1}{3}\log_6 27$

$x=\sqrt{9}\cdot\sqrt[3]{27}$
$x=3\cdot 3$
$x=9$

7. $\log_3 x + \log_3(x-1) = \log_3(3x+12)$

$x^2-x=3x+12$
$x^2-4x-12=0$
$(x-6)(x+2)=0$ $x=6$ ✓ ~~$x=-2$~~

8. $\log_2 10 - \log_2 x = \log_2 5$

$\frac{10}{x}=5$
$10=5x$
$2=x$

9. $\log_3 14 + \log_3 m = \log_3 42$

$14m=42$
$m=3$

10. $\log_3(x+5) + \log_3(x-2) = \log_3 18$

$(x+5)(x-2)=18$
$x^2+3x-10=18$
$x^2+3x-28=0$
$(x+7)(x-4)=0$
~~$x=-7$~~ $x=4$ ✓