If $\log_{\text{base}}$ # = exponent, then $\text{base}^{\text{exponent}}$ = number.

1. Use the properties to condense the equation, if necessary.
2. If the equation only has logs on one side of the equal sign, you will have to rewrite it as an exponential 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. $\log_4(2x) + \log_4(x-2) = 2$

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

$\log_4(2x^2-4x) = 2$

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

$16 = 2x^2-4x$ -16 -16

divide by 2

$\frac{0}{2} = \frac{2x^2-4x-16}{2}$

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

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

$x=4 \checkmark \quad x=-2$

2. $\log_2(4x) - \log_2(x-2) = 3$

$\log_2\left(\frac{4x}{x-2}\right) = 3$

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

$\frac{8}{1} = \frac{4x}{x-2}$

$4x = 8(x-2)$

$4x = 8x-16$

$-8x \quad -8x$

$\frac{-4x}{-4} = \frac{-16}{-4}$

$x = 4 \checkmark$

3. $\log(x^2+21x) = 2$

$10^2 = x^2+21x$

$-100 \quad -100$

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

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

$x=-25 \checkmark \quad x=4 \checkmark$

$4^2 + 21(4)$

$16 + 84 = 100 \checkmark$

$-25^2 + (21)(-25)$

$625 + -525 = 100 \checkmark$

Logarithmic Equations – CW Day 2
Algebra II with Support

Name:

If $\log_{\text{base}} \# = \text{exponent}$, then $\text{base}^{\text{exponent}} = \text{number}$.

1. Use the properties to condense the equation, if necessary.
2. If the equation only has logs on one side of the equal sign, you will have to rewrite it as an exponential 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. $\log_2(4-5x)=2$

$2^2=4-5x$
$4=4-5x$
$0=-5x$
$0=x$

2. $\log_4(5x-1)=3$

$4^3=5x-1$
$64=5x-1$
$65=5x$
$13=x$

3. $\log(x^2+21x)=2$

$10^2=x^2+21x$
$0=x^2+21x-100$
$0=(x+25)(x-4)$
$x=-25$ $x=4$

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

$\log_4(2x^2-4x)=2$
$4^2=2x^2-4x$
$16=2x^2-4x$
$0=x^2-2x-8$
$0=(x-4)(x+2)$
$x=4$ $x\neq -2$

5. $\log_6(y+4)+\log_6(3y)=2$

$\log_6(3y^2+12y)=2$
$6^2=3y^2+12y$
$3y^2+12y-36=0$
$y^2+4y-12=0$
$(x+6)(x-2)=0$
$x=-6$ $x=2$

6. $\log(x+9)-\log x=1$

$\log\left(\frac{x+9}{x}\right)=1$
$\frac{x+9}{x}=10$
$x+9=10x$
$10x=x+9$
$9x=9$
$x=1$

7. $\log_3 x+\log_3(x-6)=3$

$\log_3(x^2-6x)=3$
$3^3=x^2-6x$
$0=x^2-6x-27$
$0=(x+3)(x-9)$
$x\neq -3$ $x=9$

8. $\log_4 192-\log_4(3x)=2$

$\log_4\left(\frac{192}{3x}\right)=2$
$4^2=\frac{192}{3x}$
$48x=192$
$x=4$

9. $\log_2(4x)-\log_2(x-2)=3$

$\log_2\frac{4x}{x-2}=3$
$2^3=\frac{4x}{x-2}$
$4x=8(x-2)$
$4x=8x-16$
$-4x=-16$
$x=4$

10. $\log_4(x-15)-\log_4 x=2$

$\log_4\left(\frac{x-15}{x}\right)=2$
$4^2=\frac{x-15}{x}$
$16x=x-15$
$x\neq -1$

Algebra 2

Name_____ ID: 1

Logarithmic Equations Day 2

Date_____ Period____

Solve each equation.

1) $\log_8 2 + \log_8 5x = 2$

2) $\log_2 (x^2 + 4) - \log_2 5 = 2$

3) $\log_9 (x + 24) + \log_9 x = 2$

4) $\log_3 (x^2 + 3) - \log_3 4 = 1$

5) $\log_6 5x^2 + \log_6 5 = 4$

6) $\log_5 2x^2 - \log_5 9 = 5$

$\log_5 \frac{2x^2}{9} = 5$

$\frac{2x^2}{9} = 5^5$

7) $\log_7 10 + \log_7 -3x = 2$

8) $\log_3 (x - 8) + \log_3 7 = 3$

9) $\log_2 (x - 7) - \log_2 10 = 4$

10) $\log_2 (x^2 - 1) - \log_2 6 = 2$