Algebra II 300 **Log Equations Day 2**

Name_____ Date_____

Solve each equation.

1. $\log_3 2 + \log_3 7 = \log_3 x$

$\log_3 14 = \log_3 x$

$x = 14$ //

2. $\log_5 42 - \log_5 6 = \log_5 k$

$\log_5 7 = \log_5 k$

$k = 7$ //

3. $\log_5 m = \frac{1}{4}\log_5 625$

$\log_5 m = \log_5 \sqrt[4]{625}$

$m = 5$ //

4. $\log y = \frac{1}{3}\log 8 + \frac{1}{2}\log 81$

$\log y = \log 8^{\frac{1}{3}} + \log 81^{\frac{1}{2}}$

$\log y = \log 2 + \log 9$

$y = 18$ //

5. $\log_9 5 + \log_9 (n+1) = \log_9 6n$

$\log_9 5(n+1) = \log_9 6n$

$5(n+1) = 6n$

$5n + 5 = 6n \quad n = 5$ //

6. $3\log_5 x - \log_5 4 = \log_5 16$

$\log_5 x^3 - \log_5 4 = \log_5 16$

$\log_5 x^3 = \log_5 16 + \log_5 4$

$x^3 = 64 \quad x = 4$ //

7. $2\log_3 y + \log_3 0.1 = \log_3 5 + \log_3 2$

$\log_3 y^2 + \log_3 10^{-1} = \log_3 10$

$\frac{y^2 \cdot 10^{-1}}{10^{-1}} = \frac{10}{10^{-1}}$ | $y = \pm 10$

$y^2 = 10^2 \therefore$ | since $y > 0$,

$y = 10$ //

8. $\log_5 (2x-1) - \log_5 2 - \log_5 4 = \log_5 (x+1)$

$\log_5 \left(\frac{2x-1}{2 \cdot 4}\right) = \log_5 (x+1)$

$\frac{2x-1}{8} = \frac{x+1}{1}$ | $6x = -9$

$8x + 8 = 2x - 1$ | $x = -\frac{3}{2}$

$\therefore$ no solution.

9. $\log_6 48 - \log_6 \frac{16}{5} + \log_6 5 = \log_6 5x$

$\log_6 \left(\cancel{48}^{3} \times \frac{5}{\cancel{16}} \times \frac{5}{1}\right) = \log_6 5x$

$\log_6 75 = \log_6 5x$

$75 = 5x$

$x = 15$ //

10. $\log_3 64 - \log_3 \frac{8}{3} + \log_3 2 = \log_3 4r$

$\log_3 \left(\cancel{64}^{8} \times \frac{3}{\cancel{8}} \times 2\right) = \log_3 4r$

$\log_3 48 = \log_3 4r$

$48 = 4r$

$r = 12$ //

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* $\log_6 x = 2$
$\therefore x = 6^2$

11. $\log_6(b^2+2)+\log_6 2 = 2$

$\log_6 2(b^2+2) = 2$.

$b^2 = 2(b^2+2)$.
$36 = 2b^2+4$.
$2b^2 = 32$.
$b^2 = 16$
$b = \pm 4$ //

12. $\log(3x-1)-\log(x+2)=1$

$\log\left(\frac{3x-1}{x+2}\right) = 1$.

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

$10x+20 = 3x-1$.
$7x = -21$
$x = -3$ $\therefore x > 0$
$\therefore$ no solution.

Review:

Use $\log_3 2 \approx 0.631$ and $\log_3 7 \approx 1.771$ to evaluate each expression.

13. $\log_3 49$

$\log_3 7^2$.
$= 2(\log_3 7)$.
$= 2(1.771)$.
$= 3.542$ //

14. $\log_3 14$

$\log_3 2 + \log_3 7$.
$= (0.631)+(1.771)$
$= 2.402$ //

15. $\log_3 \frac{14}{49}$

$\log_3 \frac{2}{7}$.
$= \log_3 2 - \log_3 7$.
$= 0.631 - 1.771$.
$= -1.14$.

Write as a single logarithm.

16. $\log(xy^2)+2\log\frac{x}{y}-3\log\left(yx^{\frac{2}{3}}\right)$

$= \log(xy^2)+\log\left(\frac{x}{y}\right)^2-\log\left(yx^{\frac{2}{3}}\right)^3$.
$= \log(xy^2)+\log\left(\frac{x^2}{y^2}\right)-\log(y^3x^2)$

$= \log\left(\frac{xy^2 \cdot \frac{x^2}{y^2}}{y^3x^2}\right) = \log\left(\frac{x^3}{y^3x^2}\right)$.

$= \log\left(\frac{x}{y^3}\right)$.

Expand the logarithm.

17. $\log_3\left(\frac{z^2\sqrt[3]{x}}{6y^4}\right)$

$= \log_3 z^2 + \log_3 \sqrt[3]{x} - \log_3 6y^4$
$= 2\log_3 z + \frac{1}{3}\log_3 x - \log_3 6 - \log_3 y^4$.
$= 2\log_3 z + \frac{1}{3}\log_3 x - \log_3 6 - 4\log_3 y$