## 8.3 Properties of Logarithms SOLUTIONS PRACTICE

**DIRECTIONS: Expand each Logarithm.**

1) $\log_2 3x$

$\log_2 3 + \log_2 x$

2) $\log_5 \frac{4}{c}$

$\log_5 4 - \log_5 c$

3) $\log_9 3h^3$

$\log_9 3 + \log_9 h^3$

$\log_9 3 + 3\log_9 h$

4) $\log_6 \frac{5h}{4}$

$\log_6 5 + \log_6 h - \log_6 4$

5) $\log(5t)^{x+2}$

$\log 5^{x+2} + \log t^{x+2}$

$(x+2)\log 5 + (x+2)\log t$

6) $\ln\sqrt{2h}$

$\ln(2h)^{1/2} = \ln 2^{1/2} + \ln h^{1/2}$

$= \frac{1}{2}\ln 2 + \frac{1}{2}\ln h$

**DIRECTIONS: Condense each logarithm.**

7) $\log_4 6 + \log_4 2$

$= \log_4 6(2)$

$= \log_4 12$

8) $\log_7 8 - \log_7 x$

$\log_7 \frac{8}{x}$

9) $\frac{1}{2}\log_2 x$

$\log_2 x^{1/2} = \log_2 \sqrt{x}$

10) $4\ln x + \ln 5$

$\ln x^4 + \ln 5$

$\ln 5x^4$

11) $\log_3 6 + \log_3 y - \log_3 2$

$\log_3 \frac{6y}{2}$

12) $3\log x - 2\log y - \log z$

$\log x^3 - \log y^2 - \log z$

$\log \frac{x^3}{y^2 z}$

**DIRECTIONS: Simplify.**

13) $\log_4 40 + \log_4 25.6$

$\log_4 (40)(25.6)$

$x = \log_4 1024$

$4^x = 1024$

$4^x = 4^5$

$x = 5$

14) $\log_{x+2}(x^2+4x+4)^4 + \log_5 5$

$= \log_{x+2}((x+2)^2)^4 + 1$

$= \log_{x+2}(x+2)^8 + 1$

$= 8 + 1$

$= 9$

15) $\log_2 60 + \log_2 12.8 - \log_2 6$

$\log_2 \frac{60(12.8)}{6} = \log_2 \frac{768}{6}$

$x = \log_2 128$

$2^x = 128$

$2^x = 2^7 \rightarrow x = 7$

14) $\log_{x-3}(x-3)^3$

3

15) $\log_{x+2}(x^2+4x+4)^4 + \log_5 5$

$= \log_{x+2}((x+2)^2)^4 + 1$

$= \log_{x+2}(x+2)^8 + 1$

$= 8 + 1$

$= 9$

16) $\log_3 27 + \log_3 54 - \log_3 2$

$\log_3 \frac{27(54)}{2} = \log_3 \frac{1458}{2}$

$x = \log_3 729$

$3^x = 729$

$3^x = 3^6$

$x = 6$

**Solve. Express your radical solutions in the simplest form.**

17) $(3y)^2 + 10 = -18$

$-10 \quad -10$

$\sqrt{(3y)^2} = \sqrt{-28}$

$3y = \pm\sqrt{-4}\sqrt{7}$

$\frac{3y}{3} = \frac{\pm 2i\sqrt{7}}{3}$

$y = \frac{\pm 2i\sqrt{7}}{3}$

18) $(2t+3)^2 + 39 = 3$

$-39 \quad -39$

$\sqrt{(2t+3)^2} = \sqrt{-36}$

$2t+3 = \pm 6i$

$2t = \pm 6i - 3$

$t = \frac{\pm 6i - 3}{2} = \pm 3i - \frac{3}{2}$