Math 3 Solving with Properties of Logarithms

Name Key

I. Evaluate each expression

1. $n^{\log_n 3}$ 3	2. $14^{\log_{14} 6}$ 6

II. Use $\log_{10} 5 = 0.6990$ and $\log_{10} 7 = 0.8451$ to evaluate each expression.

3. $\log_{10} 35$ $\log_{10}5 + \log_{10}7$ $0.6990 + 0.8451 = \boxed{1.5441}$	4. $\log_{10} \frac{7}{5}$ $\log_{10}7 - \log_{10}5$ $0.8451 - 0.6990 = \boxed{0.1461}$
5. $\log_{10} 25$ $\log_{10}5^2 = 2\log_{10}5$ $= 2 \cdot 0.6990 = \boxed{1.398}$	6. $\log_{10} 490$ $\log_{10}10 \cdot 49 = \log_{10}10 \cdot 7^2$ $\log_{10}10 + \log_{10}7^2 = 1 + 2\log_{10}7$ $= 1 + 1.6902 = \boxed{2.6902}$
7. $\log_{10}\left(1\frac{3}{7}\right)$ $1\frac{3}{7} = \frac{10}{7}$ $\log_{10}10 - \log_{10}7$ $1 - 0.8451 = \boxed{0.1549}$	8. $\log_{10} 0.05$ $\log_{10}\frac{5}{100} = \log_{10}5 - \log_{10}10^2$ $0.6990 - 2 = \boxed{-1.301}$

III. Solve each equation.

9. $\log_6 x + \log_6 9 = \log_6 54$ $\log_6 9x = \log_6 54$ $9x = 54$ $\boxed{x = 6}$	10. $\log_8 48 - \log_8 w = \log_8 4$ $\log_8 \frac{48}{w} = \log_8 4$ $\frac{48}{w} = 4$ $4w = 48$ $\boxed{w = 12}$
11. $\log_7 n = \frac{2}{3}\log_7 8$ $\log_7 n = \log_7 8^{2/3}$ $n = 8^{2/3}$ $n = (\sqrt[3]{8})^2 = 2^2$ $\boxed{n = 4}$	12. $\log_3 y = \frac{1}{4}\log_3 16 + \frac{1}{3}\log_3 64$ $\log_3 y = \log_3 16^{\frac{1}{4}} + \log_3 64^{\frac{1}{3}}$ $\log_3 y = \log_3 2 + \log_3 4$ $\log_3 y = \log_3 8$ $\boxed{y = 8}$ See below
13. $\log_9 (3u+14) - \log_9 5 = \log_9 2u$ $\log_9 \frac{3u+14}{5} = \log_9 2u$ $\frac{3u+14}{5} = 2u$ $3u + 14 = 10u$ $7u = 14$ $\boxed{u = 2}$	14. $\log_7 x + \log_7 x = \log_7 12$ $\log_7 x^2 = \log_7 12$ $\sqrt{x^2} = \sqrt{12}$ $x = \pm\sqrt{12}$ $= \pm\sqrt{4}\cdot\sqrt{3} = 2\sqrt{3}$ $\boxed{x = 2\sqrt{3}}$
15. $4\log_2 x + \log_2 5 = \log_2 405$ $\log_2 x^4 + \log_2 5 = \log_2 405$ $\log_2 5x^4 = \log_2 405$ $5x^4 = 405$ $x^4 = 81$ $\boxed{x = 3}$	16. $\log_6 (2x-5) + 1 = \log_6 (7x+10)$ $\log_6 (2x-5) + \log_6 6 = \log_6 (7x+10)$ $\log_6 6(2x-5) = 7x+10$ $12x - 30 = 7x + 10$ $5x = 40$ $\boxed{x = 8}$
17. $\log_{16}(9x+5) - \log_{16}(x^2-1) = \frac{1}{2}$ $\boxed{x = 3}$ Nope!	18. $\log_8 (n-3) + \log_8 (n+4) = 1$ $\log_8 (n-3)(n+4) = \log_8 8$ $n^2 + n - 12 = 8$ $n^2 + n - 20 = 0$ $(n+5)(n-4) = 0$ $n \neq -5$ $\boxed{n = 4}$

#12) $16^{\frac{1}{4}} = \sqrt[4]{16} = 2$

18 $64^{\frac{1}{3}} = \sqrt[3]{64} = 4$