HOMEWORK 7-4

Write as single log

1) $\log_5 4 + \log_5 3 = \log_5 4 \cdot 3 = \log_5 12$ (product property)

2) $\log_6 25 - \log_6 5 = \log_6 5$ (quotient rule)

3) $\log_2 4 + \log_2 2 - \log_2 8 = \log_2 \frac{4 \cdot 2}{8} = \log_2 1 = 0$

product quotient

4) $5\log_7 X - 2\log_7 X = \log_7 X^5 - \log_7 X^2 = \log_7 \frac{X^5}{X^2} = \log_7 X^3$

error: minus (not equal)

5) $\log_4 60 - \log_4 4 + \log_4 X = \log_4 \frac{60X}{4} = \log_4 15X$

divide, multiply

6) $\log 7 - \log 3 + \log 6 = \log \frac{7 \cdot 6^2}{3} = \log 14$

7) $2\log x - 3\log y = \log x^2 - \log y^3 = \log \frac{x^2}{y^3}$

8) $\frac{1}{2}\log r + \frac{1}{3}\log s - \frac{1}{4}\log t = \log r^{\frac{1}{2}} + \log s^{\frac{1}{3}} - \log t^{\frac{1}{4}}$

$= \log \sqrt{r} + \log \sqrt[3]{s} - \log \sqrt[4]{t}$

$= \log \frac{\sqrt{r} \cdot \sqrt[3]{s}}{\sqrt[4]{t}}$

9) $\log_3 4x + 2\log_3 (5y) = \log_3 4x + \log_3 (5y)^2$

$= \log_3 4x + \log_3 (25y^2)$

$= \log_3 100xy^2$

10) $5\log 2 - 2\log 2 = \log 2^5 - \log 2^2 = \log \frac{2^5}{2^2} = \log 2^3$
$= \log 8$

11) $\frac{1}{3}\log 3x + \frac{2}{3}\log 3x = \frac{3}{3}\log 3x = \log 3x$

exactly the same

(add fractions)

12) $2\log 4 + \log 2 + \log 2 = \log 4^2 \cdot 2 \cdot 2 = \log 64$

13) $(\log 3 - \log 4) - \log 2 = \log 3 - \log 4 - \log 2$
$= \log \frac{3}{4 \cdot 2} = \log \frac{3}{8}$

14) $5\log x + 3\log x^2 = \log x^5 + \log (x^2)^3$

power property $= \log x^5 + \log x^6 = \log x^5 \cdot x^6$
$= \log x^{11}$

15) $\log_6 3 - \log_6 6 = \log_6 \frac{3}{6} = \log_6 \frac{1}{2}$

16) $\log 2 + \log 4 - \log 7 = \log \frac{2 \cdot 4}{7} = \log \frac{8}{7}$

17) $\log_3 2x - 5\log_3 y = \log_3 2x - \log_3 y^5 = \log_3 \frac{2x}{y^5}$

18) $\frac{1}{3}(\log_2 x - \log_2 y) = \frac{1}{3}\log_2 \frac{x}{y} = \log \left(\frac{x}{y}\right)^{\frac{1}{3}} = \log \sqrt[3]{\frac{x}{y}}$

19) $\frac{1}{2}\log x + \frac{1}{3}\log y - 2\log z = \log x^{\frac{1}{2}} + \log y^{\frac{1}{3}} - \log z^2$
$= \log \frac{x^{\frac{1}{2}} \cdot y^{\frac{1}{3}}}{z^2} = \log \frac{\sqrt{x}\sqrt[3]{y}}{z^2}$

20) $3(4\log t^2) = 12\log t^2 = \log(t^2)^{12} = \log t^{24}$

21) $\log_5 y - 4(\log_5 r + 2\log_5 t) = \log_5 y - 4\log_5 r - 8\log_5 t$

$= \log_5 y - \log_5 r^4 - \log_5 t^8$

$= \log_5 \frac{y}{r^4 t^8}$

EXPAND

22) $\log xyz = \log x + \log y + \log z$

23) $\log_2 \frac{x}{yz} = \log_2 x - \log_2 y - \log_2 z$

24) $\log 6x^3y = \log 6 + 3\log x + \log y$

25) $\text{Log}\, 7(3x-2)^2 = \log 7 + \log(3x-2)^2$

$= \log 7 + 2\log(3x-2)$

26) $\log\sqrt{\frac{2rst}{5w}} = \log\left(\frac{2rst}{5w}\right)^{\frac{1}{2}} = \frac{1}{2}\log\frac{2rst}{5w}$

$= \frac{1}{2}\log 2 + \frac{1}{2}\log r + \frac{1}{2}\log s + \frac{1}{2}\log t - \frac{1}{2}\log 5 - \frac{1}{2}\log w$

27) $\log\frac{5x}{4y} = \log 5 + \log x - \log 4 - \log y$

28) $\log_5 5x^{-5} = \log_5 5 + \log_5 x^{-5} = 1 - 5\log_5 x$

29) $\log\frac{2x^2y}{3k^3} = \log 2 + 2\log x + \log y - \log 3 - 3\log k$

30) $\log_4(3xyz)^2 = 2\log_4 3xyz = 2(\log_4 3 + \log_4 x + \log_4 y + \log_4 z)$

$= 2\log_4 3 + 2\log_4 x + 2\log_4 y + 2\log_4 z$

31) $\log 12 = \log 4 + \log 3$ True because product property

32) $\log \frac{3}{5} = \frac{\log 3}{\log 5}$ FALSE

correction $\log \frac{3}{5} = \log 3 - \log 5$ (quotient prop

33) $\log_6 12 + \log_6 3 = 2$

$\log_6 12 \cdot 3 = 2$

$\log_6 36 = 2$ True because $6^2 = 36$!

34) $\frac{1}{2} \log_4 4x = \log_4 2x$

$\text{Log}_4 (4x)^{\frac{1}{2}} = \log_4 2x$ FALSE! (power of applies to not only

$\text{Log}_4 \sqrt{4x} = \log_4 2\sqrt{x}$

EVALUATE

35) $\log_2 8 + \log_2 4 = \log_2 32 = \boxed{5}$ because $(2^5 = 32)$

36) $\log_2 160 - \log_2 5 = \log_2 \frac{160}{5} = \log_2 32 = \boxed{5}$

37) $\log_6 27 + \log_6 8 = \log_6 27 \cdot 8 = \log_6 216 = \boxed{3}$ (6

38) $\log_7 14 - \log_7 2 = \log_7 \frac{14}{2} = \log_7 7 = 1$

39) $\log_4 64 + 2\log_4 2 = \log_4 64 + \log_4 2^2 = \log_4 64 \cdot 4$

$= \log_4 256 = 4$

(because $4^4 = 216$)

40) $\frac{1}{4}\log_3 162 - \log_3 \sqrt[4]{2} = \log_3 162^{\frac{1}{4}} - \log_3 2^{\frac{1}{4}}$

$= \log_3 \left(\frac{162}{2}\right)^{\frac{1}{4}} = \log_3 81^{\frac{1}{4}} = \log_3 3 = 1$