

## Putting it All Together!

### CONDENSING LOGS

Directions: Rewrite as a single logarithm. Simplify if possible.

19.  $2 \cdot \log_2 6 - \log_2 9$

$$\log_2 \frac{6^2}{9} = \log_2 \frac{36}{9} = \boxed{\log_2 4}$$

20.  $4 \cdot \log_4 a + 2 \cdot \log_4 b$

$$\log_4 a^4 + \log_4 b^2 = \boxed{\log_4 a^4 b^2}$$

21.  $7 \cdot \log_4 u - 3 \cdot \log_4 v^2$

$$\log_4 u^7 - \log_4 v^6 = \boxed{\log_4 \frac{u^7}{v^6}}$$

22.  $\log_2 15 + \log_2 4 - \log_2 6$

$$\log_2 \frac{15 \cdot 4}{6} = \boxed{\log_2 10}$$

23.  $\log_3 4 + \log_3 y + \frac{1}{2} \cdot \log_3 49$

$$\log_3 4 \cdot y \cdot 49^{1/2} = \log_3 4 \cdot y \cdot 7 = \boxed{\log_3 28y}$$

24.  $\frac{1}{3}(\log_5 8 + \log_5 27) - \log_5 3$

$$\log_5 \frac{8^{1/3} \cdot 27^{1/3}}{3} = \log_5 \frac{2 \cdot 3}{3} = \boxed{\log_5 2}$$

25.  $3 \cdot \log_2 4 - \log_2 32$

$$\log_2 \frac{4^3}{32} = \log_2 \frac{64}{32} = \boxed{\log_2 2}$$

26.  $2 \cdot \log_6 6 - \frac{1}{4} \cdot \log_6 16 + \log_6 3$

$$\log_6 \frac{6^2}{16^{1/4}} + \log_6 3 = \log_6 \frac{36}{2} + \log_6 3 = \boxed{\log_6 54}$$

### EXPANDING LOGS

Directions: Expand each logarithm.

27.  $\log_6 (xyz^4)$

$$\log_6 x + \log_6 y + \log_6 z^4 = \boxed{\log_6 x + \log_6 y + 4 \log_6 z}$$

28.  $\log_4 \left(\frac{a^9}{b}\right)$

$$\log_4 a^9 - \log_4 b = \boxed{9 \cdot \log_4 a - \log_4 b}$$

29.  $\log_7 (q^4 r^2)$

$$2(\log_7 q^4 + \log_7 r^2) = 2(4 \cdot \log_7 q + 2 \log_7 r) = \boxed{8 \log_7 q + 4 \log_7 r}$$

30.  $\log_2 \left(\frac{y}{z^5}\right)^2 = 2(\log_2 y - \log_2 z^5)$

$$= 2(\log_2 y - 5 \log_2 z) = \boxed{2 \log_2 y - 10 \log_2 z}$$

31.  $\log \sqrt{7x^3} = \frac{1}{2}(\log 7 + \log x^3)$

$$= \frac{1}{2}(\log 7 + 3 \log x) = \boxed{\frac{1}{2} \log 7 + \frac{3}{2} \log x}$$

32.  $\log_3 \sqrt[4]{m^5 n^2} = \frac{1}{4}(\log_3 m^5 + \log_3 n^2)$

$$= \frac{1}{4}(5 \log_3 m + 2 \log_3 n) = \boxed{\frac{5}{4} \log_3 m + \frac{1}{2} \log_3 n}$$