HW #25 (4.4) 8, 12, 18, 28, 32, 46, 48, 50, 52

8) $\log_2 160 - \log_2 5$

$= \log_2 \frac{160}{5} = \log_2 32 = \log_2 2^5$ $\boxed{= 5}$

12) $\log_{12} 9 + \log_{12} 16$

$= \log_{12}(9 * 16) = \log_{12} 144 = \log_{12} 12^2$ $\boxed{= 2}$

18) $\ln(\ln e^{e^{200}})$

$= \ln(e^{200} \ln e) = \ln e^{200} = 200 \ln e$ $\boxed{= 200}$

28) $\log_2 (xy)^{10}$

$= 10 \log_2 xy$ $\boxed{= 10(\log_2 x + \log_2 y)}$

32) $\ln \sqrt[3]{3r^2 s}$

$= \frac{1}{3} \ln(3r^2 s) = \frac{1}{3}[\ln 3 + \ln r^2 + \ln s]$ $\boxed{= \frac{1}{3}[\ln 3 + 2\ln r + \ln s]}$

46) $\log 12 + \frac{1}{2} \log 7 - \log 2$

$= \log 12 + \log 7^{1/2} - \log 2 = \log 12\sqrt{7} - \log 2 = \log\left(\frac{12\sqrt{7}}{2}\right)$ $\boxed{= \log 6\sqrt{7}}$

48) $\log_5 (x^2 - 1) - \log_5 x - 1$

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

50) $\ln(a+b) + \ln(a-b) - 2\ln c$

$= \ln((a+b)(a-b)) - \ln c^2$ $\boxed{= \ln\left(\frac{a^2 - b^2}{c^2}\right)}$

52) $2(\log_5 x + 2\log_5 y - 3\log_5 z)$

$= 2\log_5 x + 4\log_5 y - 6\log_5 z = \log_5 x^2 + \log_5 y^4 - \log_5 z^6$

$= \log_5 (x^2 \cdot y^4) - \log_5 z^6$ $\boxed{= \log_5 \left(\frac{x^2 y^4}{z^6}\right)}$