1.2.4

a) $\log(16) + 2\log(3) - 2\log(2) - \frac{1}{2}\log(9)$

$= \log(2^4) + 2\log(3) - 2\log(2) - \frac{1}{2}\log(3^2)$

$= 4\log(2) - 2\log(2) + 2\log(3) - \log(3)$

$= 2\log(2) + \log(3)$

b) $\log(15) + 3\log(10) - \log(30) - \log(5)$

$= \log(3) + \log(5) + 3\log(2) + 3\log(5)$

$\quad - \underbrace{\log(2) - \log(3) - \log(5)}_{-\log(30)} - \log(5)$

$= 2\log(2) + 2\log(5) = 2(\log(2) + \log(5))$

$= 2\underbrace{\log(10)}_{=1} = 2$

c) $4\log(5) - \log(5) - 3\log(3) + \log(3)$

$= 3\log(5) - 2\log(3)$

d) $$\frac{\log(4\cdot 5) + 2 - \log(2)}{\log(5\cdot 1000) - \log(5) + \log(10^{-1})}$$

$$= \frac{2\log(2) + \log(5) + 2 - \log(2)}{\log(5) + 3 - \log(5) - 1}$$

$$= \frac{2 + \log(5) + \log(2)}{2} = \frac{2 + \log(10)}{2}$$

$$= \frac{2+1}{2} = \frac{3}{2}$$