

Ex 42 p 165

$$\begin{aligned}
 a &= \ln 4 + \ln 5 \\
 &= \ln(4 \times 5) \\
 &= \ln 20
 \end{aligned}$$

$$\begin{aligned}
 b &= \ln 6 - \ln 7 \\
 &= \ln \frac{6}{7}
 \end{aligned}$$

$$\begin{aligned}
 c &= \frac{1}{2} \ln 3 - \ln 5 \\
 &= \ln \sqrt{3} - \ln 5 \\
 &= \ln \left(\frac{\sqrt{3}}{5} \right)
 \end{aligned}$$

$$\begin{aligned}
 d &= 2 \ln 6 \\
 &= \ln 6^2 \\
 &= \ln 36
 \end{aligned}$$

$$\begin{aligned}
 e &= -\ln 2 + 1 \\
 &= \ln e - \ln 2 \\
 &= \ln \frac{e}{2}
 \end{aligned}$$

$$\begin{aligned}
 f &= 3 \ln 5 + \frac{1}{2} \\
 &= \ln 5^3 + \frac{1}{2} \ln e \\
 &= \ln 125 + \ln \sqrt{e} \\
 &= \ln(125\sqrt{e})
 \end{aligned}$$

Ex 43 p 165

$$\begin{aligned}
 a &= 3 \ln 2 + 2 \ln 3 \\
 &= \ln 2^3 + \ln 3^2 \\
 &= \ln 8 \times 9 \\
 &= \ln 72
 \end{aligned}$$

$$\begin{aligned}
 b &= -2 \ln 3 \\
 &= \ln 3^{-2} \\
 &= \ln \frac{1}{9}
 \end{aligned}$$

$$\begin{aligned}
 c &= \ln 45 - \ln 9 \\
 &= \ln \frac{45}{9} \\
 &= \ln 5
 \end{aligned}$$

$$\begin{aligned}
 d &= 4 \ln 2 - \frac{1}{2} \\
 &= \ln 2^4 - \frac{1}{2} \ln e \\
 &= \ln 16 - \ln \sqrt{e} \\
 &= \ln \left(\frac{16}{\sqrt{e}} \right)
 \end{aligned}$$

$$\begin{aligned}
 e &= \frac{1}{2} (\ln 5 + \ln 3) \\
 &= \frac{1}{2} \ln(5 \times 3) \\
 &= \ln \sqrt{15}
 \end{aligned}$$

$$\begin{aligned}
 f &= 4 + \frac{1}{2} \ln 5 \\
 &= \ln e + \ln \sqrt{5} \\
 &= \ln(e\sqrt{5})
 \end{aligned}$$

Ex 44 p 165

$$\begin{aligned}
 a &= 3 + \ln 2 \\
 &= 3 \ln e + \ln 2 \\
 &= \ln(2e^3)
 \end{aligned}$$

$$\begin{aligned}
 b &= -\ln 3 - \ln 7 \\
 &= \ln \frac{1}{3} + \ln \frac{1}{7} \\
 &= \ln \frac{1}{21}
 \end{aligned}$$

$$\begin{aligned}
 c &= \ln 6 - 2 \\
 &= \ln 6 - \ln e^2 \\
 &= \ln \left(\frac{6}{e^2} \right)
 \end{aligned}$$

$$\begin{aligned}
 d &= 2 \ln \left(\frac{1}{2} \right) - \frac{1}{2} \\
 &= \ln \frac{1}{4} - \ln \sqrt{e} \\
 &= \ln \left(\frac{1}{4\sqrt{e}} \right)
 \end{aligned}$$

$$\begin{aligned}
 e &= -1 - \ln 2 + \ln 3 \\
 &= \ln \frac{1}{e} - \ln 2 + \ln 3 \\
 &= \ln \left(\frac{3}{2e} \right)
 \end{aligned}$$

$$\begin{aligned}
 f &= 2 + 2 \ln 5 \\
 &= \ln e^2 + \ln 5^2 \\
 &= \ln 25e^2
 \end{aligned}$$