

$$\begin{aligned}
& m + \log \sum_i \exp(a_i - m) \\
&= m + \log \sum_i \frac{\exp(a_i)}{\exp(m)} \\
&= m + \log \frac{1}{\exp(m)} \sum_i \exp(a_i) \\
&= m - \log \exp(m) + \log \sum_i \exp(a_i)
\end{aligned}$$