$$
\begin{aligned}
\log \mathbb{E}_{p(\mathbf{z}|\boldsymbol{\theta})} f(\mathbf{z}) &\geq \mathbb{E}_{q\left(\mathbf{z} \mid \boldsymbol{\theta}'\right)}[\log f(\mathbf{z}) p(\mathbf{z} \mid \boldsymbol{\theta})] - \mathbb{E}_{q\left(\mathbf{z} \mid \boldsymbol{\theta}'\right)}\left[\log q\left(\mathbf{z} \mid \boldsymbol{\theta}'\right)\right] \\
&= \mathbb{E}_{q\left(\mathbf{z} \mid \boldsymbol{\theta}'\right)}[\log f(\mathbf{z}) p(\mathbf{z} \mid \boldsymbol{\theta})] + H\left[q\left(\mathbf{z} \mid \boldsymbol{\theta}'\right)\right] \\
&= F(q, \boldsymbol{\theta}) \\
&= -D_{KL}\left(q\left(\mathbf{z} \mid \boldsymbol{\theta}'\right) \| \tilde{p}(\mathbf{z} \mid \boldsymbol{\theta})\right) + \log \mathbb{E}_{q(\mathbf{z}|\boldsymbol{\theta}')} f(\mathbf{z}) \frac{p(\mathbf{z} \mid \boldsymbol{\theta})}{q(\mathbf{z} \mid \boldsymbol{\theta}')},
\end{aligned}
$$