$$
\begin{aligned}
P(x;\mu,\sigma^2) &= \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(x-\mu)^2}{2\sigma^2}} \\
&= \frac{1}{\sqrt{2\pi}} \frac{1}{\sigma} e^{-\frac{(x-\mu)^2}{2\sigma^2}} \\
&= \frac{1}{\sqrt{2\pi}} e^{ln\frac{1}{\sigma}} e^{-\frac{(x-\mu)^2}{2\sigma^2}} \\
&= \frac{1}{\sqrt{2\pi}} e^{-ln(\sigma)-\frac{(x-\mu)^2}{2\sigma^2}} \\
&= \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2\sigma^2}+\frac{\mu x}{\sigma^2}-\frac{\mu^2}{2\sigma^2}+ln(\frac{1}{\sigma})} \\
&= \frac{1}{\sqrt{2\pi}} e^{[\frac{\mu}{\sigma^2} \quad -\frac{1}{2\sigma^2}][x \quad x^2]^T-\left(\frac{\mu^2}{2\sigma^2}+ln\sigma\right)}
\end{aligned}
$$

For

$$
P(x;\mu,\sigma^2) = \frac{1}{\sqrt{2\pi}} e^{[\frac{\mu}{\sigma^2} \quad -\frac{1}{2\sigma^2}][x \quad x^2]^T-\left(\frac{\mu^2}{2\sigma^2}+ln\sigma\right)} \tag{1}
$$

In Eq 1, counting measure is $1/\sqrt{2\pi}$, natural parameter η is $[\frac{\mu}{\sigma^2} \quad -\frac{1}{2\sigma^2}]$, sufficient statistics $t(x)$ are $[x \quad x^2]$, $a(\eta)$ is $\left(\frac{\mu^2}{2\sigma^2}+ln\sigma\right)$.

$$
\begin{aligned}
\eta_1 &= \frac{\mu}{\sigma^2} \\
\eta_2 &= -\frac{1}{2\sigma^2}
\end{aligned}
$$

Thus,

$$
\mu = \frac{\eta_1}{-2\eta_2}
$$

And,

$$
\begin{aligned}
a(\eta) &= \left[\frac{(\frac{\eta_1}{2\eta_2})^2}{2(\frac{1}{-2\eta_2})^2} + ln\sqrt{\frac{1}{-2\eta_2}}\right] = -\frac{1}{2}\eta_1^2\frac{1}{2\eta_2} - \frac{1}{2}ln(-2\eta_2) \\
&= \frac{\eta_1^2}{4\eta_2} - \frac{1}{2}ln(-2\eta_2)
\end{aligned}
$$