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

For

$$
P\left(x;\mu,\sigma^2\right) = \frac{1}{\sqrt{2\pi}}\exp\left(\begin{bmatrix}\frac{\mu}{\sigma^2} \\ -\frac{1}{2\sigma^2}\end{bmatrix}\cdot\begin{bmatrix}x \\ x^2\end{bmatrix}-\left(\frac{\mu^2}{2\sigma^2}+\ln\sigma\right)\right) \tag{1}
$$

In Eq (1), counting measure is $1/\sqrt{2\pi}$, natural parameter η is $\begin{bmatrix}\frac{\mu}{\sigma^2} \\ -\frac{1}{2\sigma^2}\end{bmatrix}$, sufficient statistic $t(x)$ is $\begin{bmatrix}x \\ x^2\end{bmatrix}$, $a(\eta)$ 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,

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