

| | ϕ | w | $b(\theta)$ | $c(y, \phi)$ | $\mu = b'(\theta)$ | $b''(\theta)$ |
|---|----------|-----|--------------------|--|-------------------------|---------------|
| Normal $Y \sim N(\theta, \phi)$ | $1/\phi$ | 1 | $\theta^2/2$ | $-(y^2/\phi + \log(2\pi\phi))/2$ | θ | 1 |
| Poisson $Y \sim Po(e^\theta)$ | 1 | 1 | e^θ | $-\log(y!)$ | e^θ | μ |
| Binomial: $nY \sim Bi(n, e^\theta/(1+e^\theta))$ | 1 | n | $\log(1+e^\theta)$ | $\log \binom{n}{ny}$ | $e^\theta/(1+e^\theta)$ | $\mu(1-\mu)$ |
| Gamma $Y \sim Ga(\nu, \lambda)^\dagger$ | ϕ | 1 | $-\log(-\theta)$ | $\nu \log \nu + (\nu-1) \log y$ $-\log \Gamma(\nu)$ | $-1/\theta$ | μ^2 |

† pdf $f(y) = \lambda^\nu y^{\nu-1} e^{-\lambda y} / \Gamma(\nu)$ where $\lambda = -\theta/\phi$ and $\nu = 1/\phi$.