Big Data Analysis HW 4 – Blake Hillier

The Poisson distribution has the pmf

$$\begin{aligned} P(X = k; \lambda) &= \frac{\lambda^k e^{-\lambda}}{k!} \\ &= \frac{e^{\ln|\lambda^k e^{-\lambda}|}}{k!} \\ &= \frac{e^{\ln|\lambda^k| + \ln|e^{-\lambda}|}}{k!} \\ &= \frac{e^{k\ln|\lambda| - \lambda}}{k!} \end{aligned}$$

If we let $a(\lambda) = \lambda,\ b(k) = \frac{1}{k!}$, and $T(\lambda) = \ln|\lambda|$, then the exponential form of the distribution is

$$b(\lambda)e^{kT(\lambda) - a(\lambda)}$$