(d) (continued)

so maximum likelihood parameter $\hat{\lambda}$:

$$\hat{\lambda} = \underset{\lambda}{\operatorname{argmax}}\ \ell(\lambda; x_1 \dots x_N)$$

ie. $$\frac{d}{d\lambda}\ell(\lambda; x_1 \dots x_N) = 0$$

$$\Rightarrow \frac{d}{d\lambda}\left[n\ln(\lambda) - \lambda\sum_{i=1}^{N} x_i\right] = 0$$

$$= \frac{n}{\lambda} - \sum_{i=1}^{N} x_i = 0 \quad \Longrightarrow \lambda = \frac{n}{\sum_{i=1}^{N} x_i}$$

$$\Longrightarrow \boxed{\hat{\lambda} = \frac{N}{\sum_{i=1}^{N} x_i}} \qquad \hat{\lambda} = \frac{N}{\sum_{i=1}^{N} t_i}$$

using original variable names