$y_i \sim \text{EXPONENTIAL}(\lambda)$

ASSUME $\lambda \sim \text{GAMMA}(\alpha, \beta)$

$$\pi(\lambda | y_i) \propto_\lambda \pi(y_i | \lambda)\, \pi(\lambda)$$

$$\propto_\lambda \lambda \exp(-\lambda y_i)\, \lambda^{\alpha-1} \exp(-\beta\lambda)$$

$$= \lambda^{\alpha+1-1} \exp(-\lambda(\beta + y_i))$$

$$\propto_\lambda \text{GAMMA}(\lambda; \alpha+1, \beta + y_i) \qquad \alpha \in \mathbb{N}$$