Finding MLEs (2)

1. Let $X_1, \ldots, X_n | \lambda \overset{\text{iid}}{\sim} \text{Exp}(\lambda)$, and let $Y_1, \ldots, Y_m | \lambda, \tau \overset{\text{iid}}{\sim} \text{Exp}(\tau\lambda)$, where the $\mathbf{X}$ data are independent of the $\mathbf{Y}$ data given $\boldsymbol{\theta} = (\lambda, \tau)$. Find the MLE for $\boldsymbol{\theta}$ using the data $X_1, \ldots, X_n$ and $Y_1, \ldots, Y_m$. *Don't be scared by the two sets of data. What does the likelihood for $\boldsymbol{\theta}$ look like?*

   Also, note n need not be the same as m!

2. Let $X_1, \ldots, X_n \overset{\text{iid}}{\sim} \text{Unif}[\theta_1, \theta_2]$, where $-\infty < \theta_1 < \theta_2 < \infty$ are both unknown. Find an MLE of $\boldsymbol{\theta} = (\theta_1, \theta_2)$ if one exists. *Note: the solution will rely less on Calculus and more on reasoning.*