Math 152 – Fall 2008
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warm-up # 5

Name: ________________________________

Let $X_1, X_2, \ldots, X_n$ be distributed U[0,θ]. Find the maximum likelihood estimate of of θ.

Solution:

$$\begin{aligned}
f(x|\theta) &= \frac{1}{\theta - 0} \qquad 0 < x < \theta \\
f(\underline{x}|\theta) &= \left(\frac{1}{\theta}\right)^n \qquad \forall x_i < \theta \\
\frac{\partial f(\underline{x}|\theta)}{\partial \theta} &= -n\theta^{-n-1} \\
0 &= \theta \quad ?!?!?!?!?!
\end{aligned}$$

You can't forget about the support of x (which depends on θ !!). Remember, the function becomes zero when the very first x_i gets bigger than θ. Because the function is a decreasing function of θ, you want θ to be bigger than all the xs, but no bigger than that (because then the function value would be smaller than need be). MLE of θ is $\hat{\theta} = \max(x_i)$.