Computational Statistics
PROJECT 2

A researcher wants to work with a distribution with density function given by

$$f(x;\theta) = \frac{\theta^2}{\theta+1}(1+x)\exp(-\theta x), \quad x,\theta > 0$$

You can find in file project2.txt 150 observation that he believes that come from this distribution

1. Estimate parameter θ using Maximum Likelihood method. You shall describe all steps in full detail and write your own code for this.

2. Estimate the standard error using parametric bootstrap. This implies that you need to find a way to simulate from this distribution.

3. An alternative model for the data could be one with pdf

$$f(x) = \pi\frac{\theta^2}{\theta+1}(1+x)\exp(-\theta x) + (1-\pi)\lambda\exp(-x\lambda), \quad x,\lambda,\theta > 0$$

   Estimate parameters π, θ, λ using ML method and in particular an EM algorithm. Give all the steps of the algorithm in full detail. Then implement this algorithm in `R`