1. Consider the survival model characterized by the following piecewise-constant hazard function:

\[
\lambda(t) = \begin{cases} 
\lambda_1, & 0 \leq t < \pi_1 \\
\lambda_2, & \pi_1 \leq t < \pi_2 \\
\lambda_3, & \pi_2 \leq t 
\end{cases}
\]

where \( \pi_1 \) and \( \pi_2 \) are known constants. Derive the MLEs of \( \lambda_1 \), \( \lambda_2 \), and \( \lambda_3 \) and their standard errors based on right-censored data \((x_i, \delta_i), i = 1, \ldots, n\).

2. A data set concerning leukemia remission is given in the data frame `leuk` with components `time`, `status`, and `trt`; see Le (1997, page 52) for a full explanation of the data. For the `trt=1` group, one has the Kaplan-Meier estimate \( \hat{S}(7) = 0.807 \) with \( \text{se}(\hat{S}(7)) = 0.0869 \); you may use `summary(survfit(...))` to obtain these.

   (a) Manually confirm the calculation of \( \hat{S}(7) \) and \( \text{se}(\hat{S}(7)) \).

   (b) Assuming an exponential distribution, recalculate the estimate of \( S(7) \) and the associated standard error.

Due April 17