Q470. What is maximum likelihood estimation? Could there be any case where it doesn't exist?

A method for parameter optimization (fitting a model). We choose parameters so as to maximize the likelihood function (how likely the outcome would happen given the current data and our model).
maximum likelihood estimation (MLE) is a method of estimating the parameters of a statistical model given observations, by finding the parameter values that maximize the likelihood of making the observations given the parameters. MLE can be seen as a special case of the maximum a posteriori estimation (MAP) that assumes a uniform prior distribution of the parameters, or as a variant of the MAP that ignores the prior and which therefore is unregularized.
for Gaussian mixtures, non-parametric models, it doesn't exist

Q471. What's the difference between a MAP, MOM, MLE estimator? In which cases would you want to use each?

MAP estimates the posterior distribution given the prior distribution and data which maximizes the likelihood function. MLE is a special case of MAP where the prior is uninformative uniform distribution.
MOM sets moment values and solves for the parameters. MOM has not used much anymore because maximum likelihood estimators have higher probability of being close to the quantities to be estimated and are more often unbiased.

Q3. Which of the following is/ are true about "Maximum Likelihood estimate (MLE)"?

1. **MLE may not always exist**
2. **MLE always exists**
3. **If MLE exist, it (they) may not be unique**
4. **If MLE exist, it (they) must be unique**

A. 1 and 4

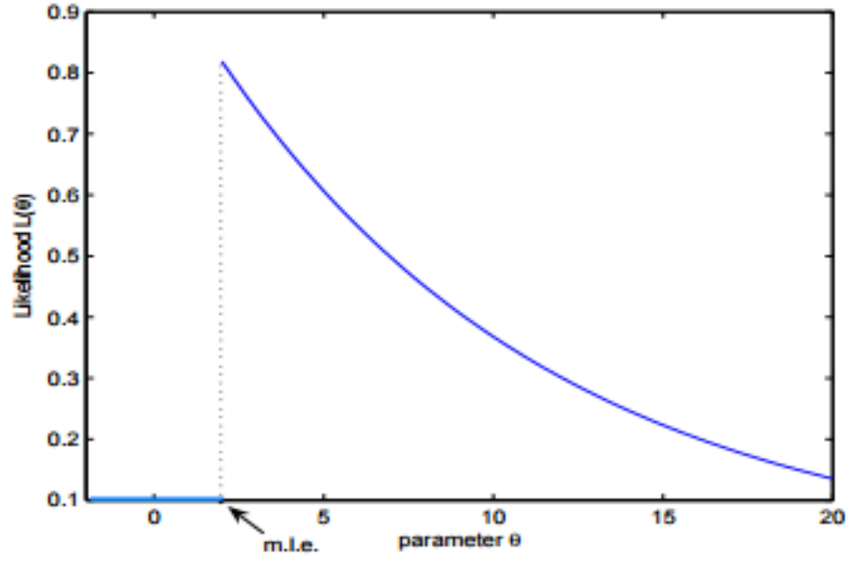
B. 2 and 3

C. 1 and 3

D. 2 and 4

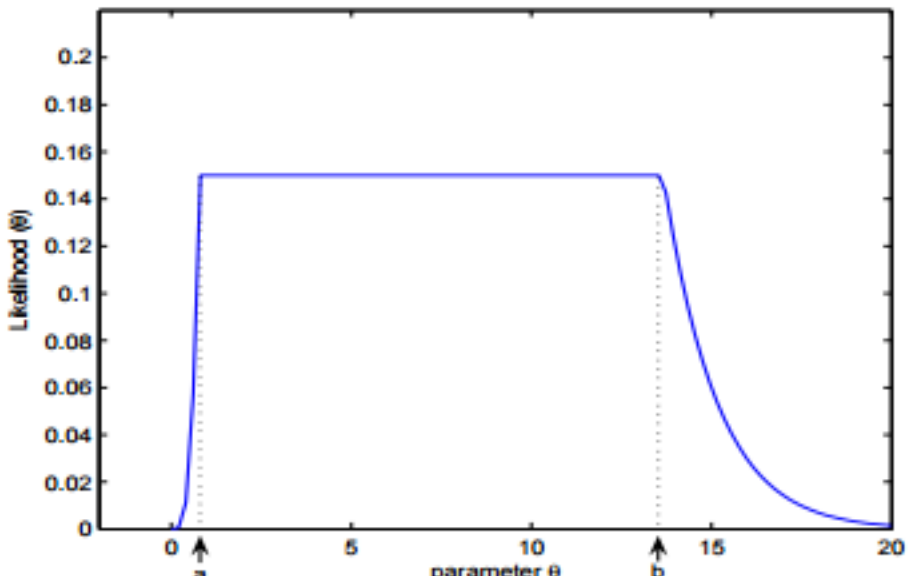
Solution: C

The MLE may not be a turning point i.e. may not be a point at which the first derivative of the likelihood (and log-likelihood) function vanishes.



The m.l.e. is a boundary point

* The MLE may not be unique.



Any point between a and b is a m.l.e