

## MTH 372: Assignment I

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### Instructions

- Use statistical software R for your codes and only basic in-built functions are allowed.
- Due date is February 20, 2023 (11.59 p.m.). No late assignments will be accepted.
- Submit all of your work which include the report, codes, results and graphs.
- Provide detailed explanations in the reports to obtain full marks.
- Follow the labelling method for your files.

### 1. Construct algorithms to answer the following

- (a) (2 points) Simulate random sample of size 1000 from Exponential ( $\lambda$ ). Use  $\lambda = 1, 2, 3, 4$ .
- (b) (4 points) For all the above mentioned values of  $\lambda$ , find the maximum likelihood estimate of the unknown parameter in R. Show the results by using three different sets of initial values, one of them would be the estimates obtained using method of moments.
- (c) (3 points) Verify the results graphically and make a comparison for above mentioned values of  $\lambda$ .

### 2. A particular data on birth weight (in grams) of newborn babies follows Normal $(\mu, \sigma^2)$ , both unknown. The data is given in attached (csv) file. Answer the following

- (a) (2.5 points) Using R, write a function to obtain the maximum likelihood estimate of the parameters.
- (b) (2.5 points) Considering one parameter as known, show graphically that the likelihood function attains maxima at the above estimate. (Hint: For one of the parameters use MLE value. Then for various values of another parameter plot the likelihood function.)
- (c) (1 point) What will be ML estimate of  $\exp(-\mu)$ .