Peter Ye
Assignment 2
ADSP31010 IP01

3.5   Homework

1. Show that the probability distributions below has the form required by the exponential family. Determine the functions $T()$, $\eta()$, $A()$, and $B()$, from the general exponential distribution for each of the probability distributions below.

- **Pareto distribution:**

$$f(y;\theta) \;\; = \theta y^{-\theta-1}$$

$$f(y;\theta) \;\; = \theta exp\left\{(-\theta-1)log(y)\right\}$$

$$f(y;\theta) \;\; = exp\left\{log(\theta)-(\theta+1)log(y)\right\}$$

$$f(y;\theta) \;\; = exp\left\{log(\theta)-\theta log(y)-log(y)\right\}$$

$$f(y;\theta) \;\; = exp\left\{-\theta log(y)+log(\theta)-log(y)\right\}$$

$T(y) = log(y)$
$\eta(\theta) = -\theta$
$A(\theta) = -log(\theta)$
$B(y) = -log(y)$

- **Exponential distribution:**

$$f(y;\theta) \;\; = \theta exp\left\{-y\theta\right\}$$

$$f(y;\theta) \;\; = ex\,p\,log(\theta)-\theta y$$

$$f(y;\theta) \;\; = exp\left\{-\theta y+log(\theta)\right\}$$

$T(y) = y$
$\eta(\theta) = -\theta$
$A(\theta) = -log(\theta)$
$B(y) = 0$

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**4. Replicate the charts for the Normal distribution shown in section 3.1. Include all 6 charts for each distribution.**
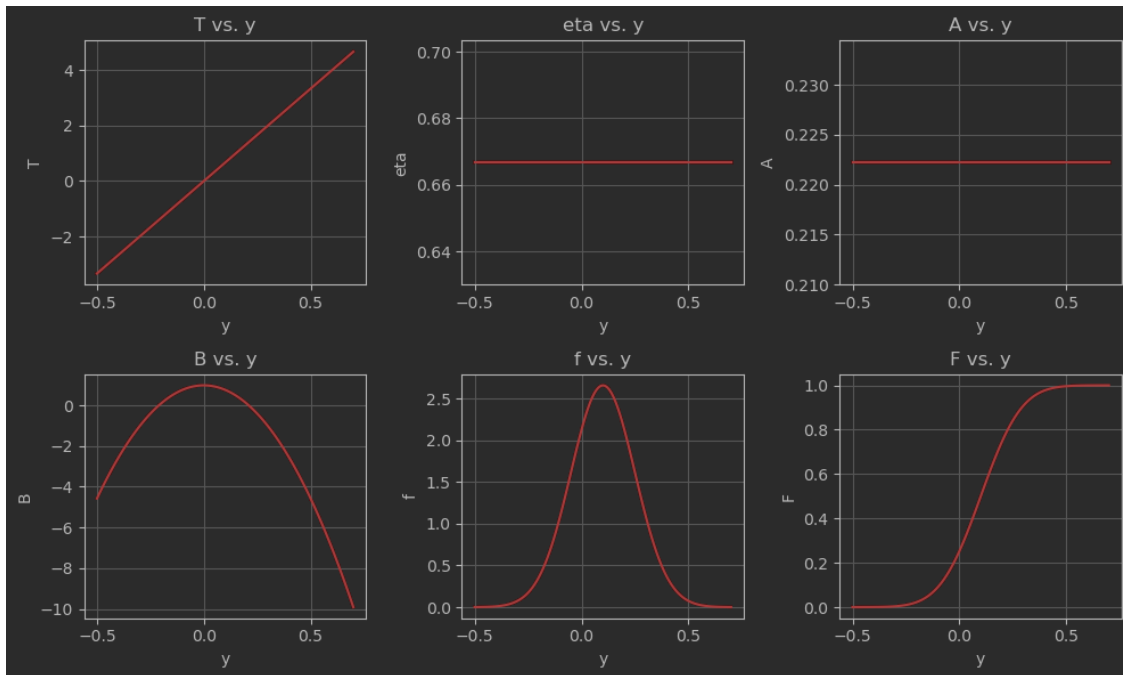
5. Replicate the charts for the Binomial distribution shown in section 3.2. Include all charts for each distribution.

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ADSP31010 IP01
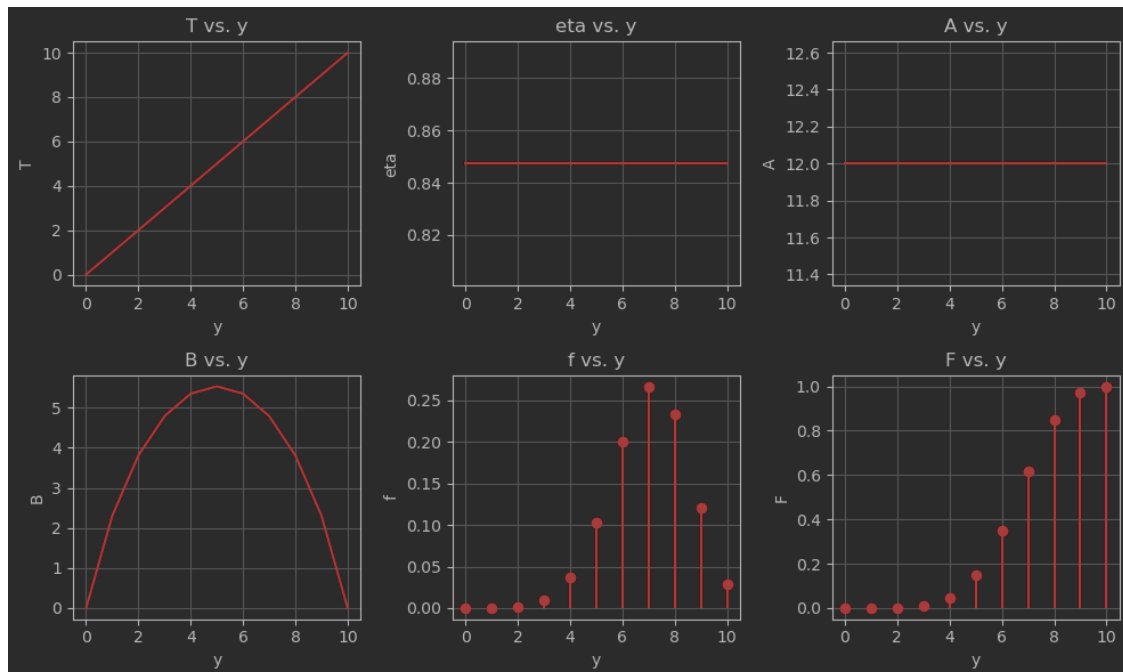
6. Replicate the charts for the Poisson distribution shown in section 3.3. Include all 6 charts for each distribution.
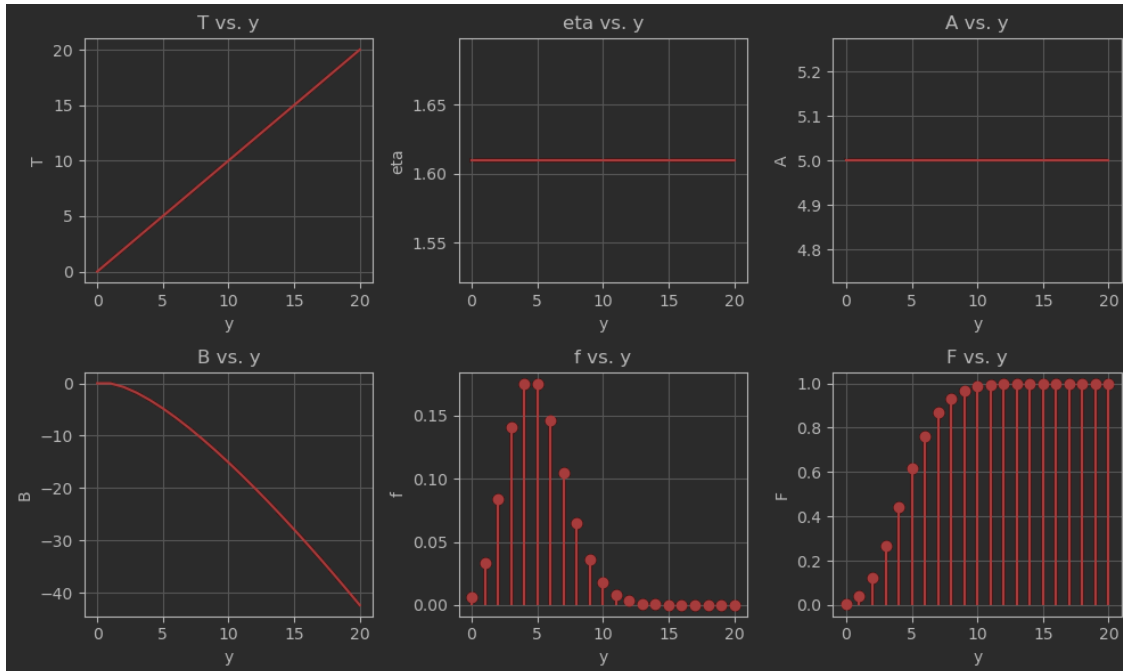
4.2 Homework

1. Based on the R dataset in the Lab folder (1030.lecture-mle.RData), reproduce the results presented above for the Binomial distribution. Plot results, maximum likelihood estimates and R code must be submitted.

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ADSP31010 IP01
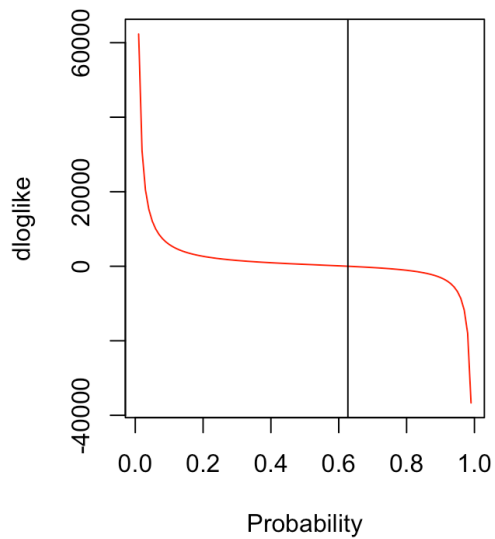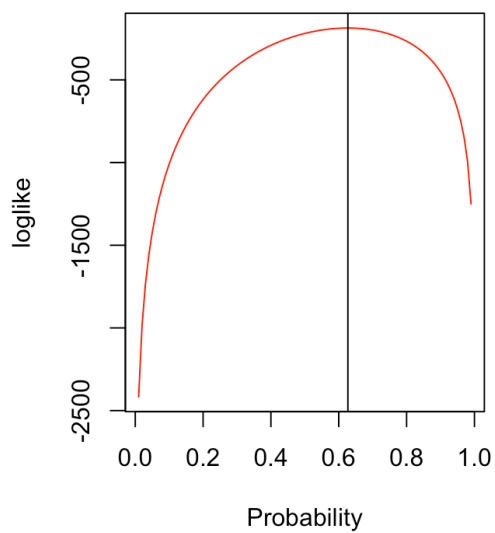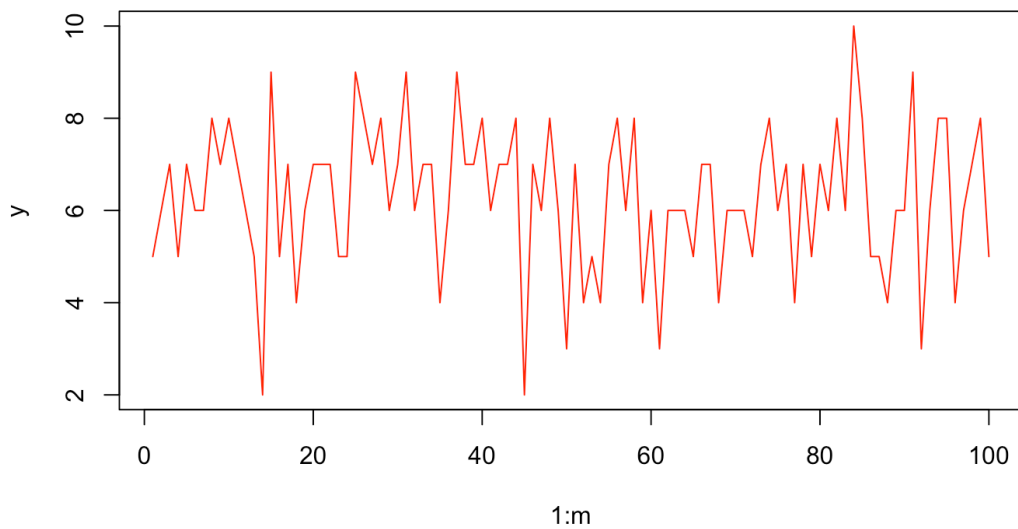
2. Based on the R dataset in the Lab folder (1030.lecture-mle.RData) reproduce the results presented above for the Poisson distribution. Plot results, maximum likelihood estimates and R code must be submitted.