w203_hw7_q3_SH

Shan He

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1. Observations

```
times = c(2.65871285, 8.34273228, 5.09845548, 7.15064545,
          0.39974647, 0.77206050, 5.43415199, 0.36422211,3.30789126,
          0.07621921, 2.13375997, 0.06577856, 1.73557740, 0.16524304,
          0.27652044)
```

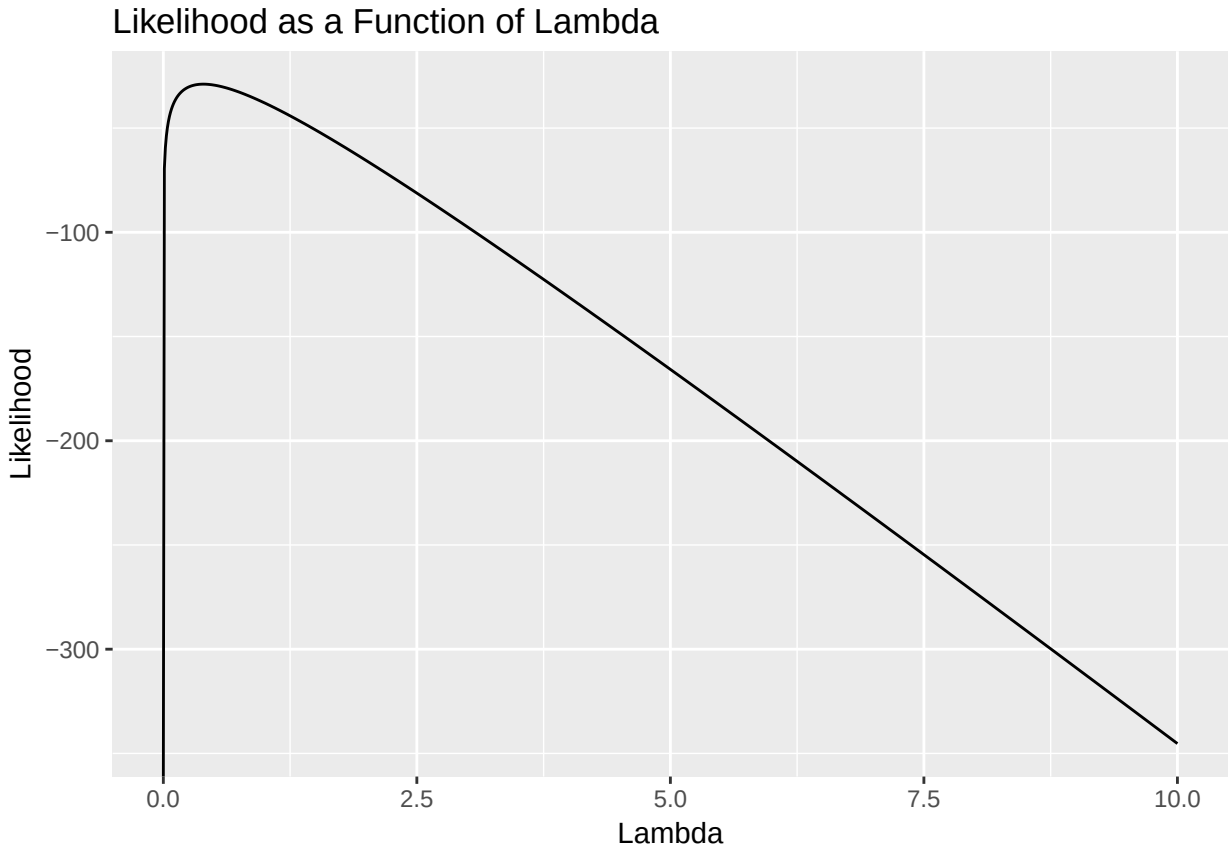
2. Likelihood Function

```
log.lklh.poisson <- function(x, lambda){
   sum(log(lambda) - x * lambda)
}
```

3. Plot Likelihood Function

```
library(ggplot2)

lambda <- seq(0 ,10 ,by = 0.01)
qplot(lambda,
      sapply(lambda, function(lambda){log.lklh.poisson(times, lambda)}),
      geom = 'line',
      main = 'Likelihood as a Function of Lambda',
      xlab = 'Lambda',
      ylab = 'Likelihood'
      )
```



4. Optimize Likelihood Function

```
fn <- function(lambda){log.lklh.poisson(times, lambda)}
optimize(fn, interval=c(0,10), maximum = T)
```

```
## $maximum
## [1] 0.3949309
##
## $objective
## [1] -28.93582
```

5. Compare MLE for Lambda to Mean

```
lambda_optim = optimize(fn, interval=c(0,10), maximum = T)$maximum
lambda_optim
```

```
## [1] 0.3949309
```

```
1/mean(times)
```

```
## [1] 0.3949269
```

The MLE for Lambda is the approximately the same as $1/E(x)$ just as expected.