Problems Sheet 1

Statistics 2

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Question 4

Part a)

```
xobs <- rexp(10,rate=0.3) # Sample 10 values from Exp(0.3) distribution
xobs
```

```
##  [1] 0.5703693 4.2013839 1.7229474 5.4031092 2.5544691 0.7798337 6.5379667
##  [8] 5.5766792 7.6785288 0.5681968
```

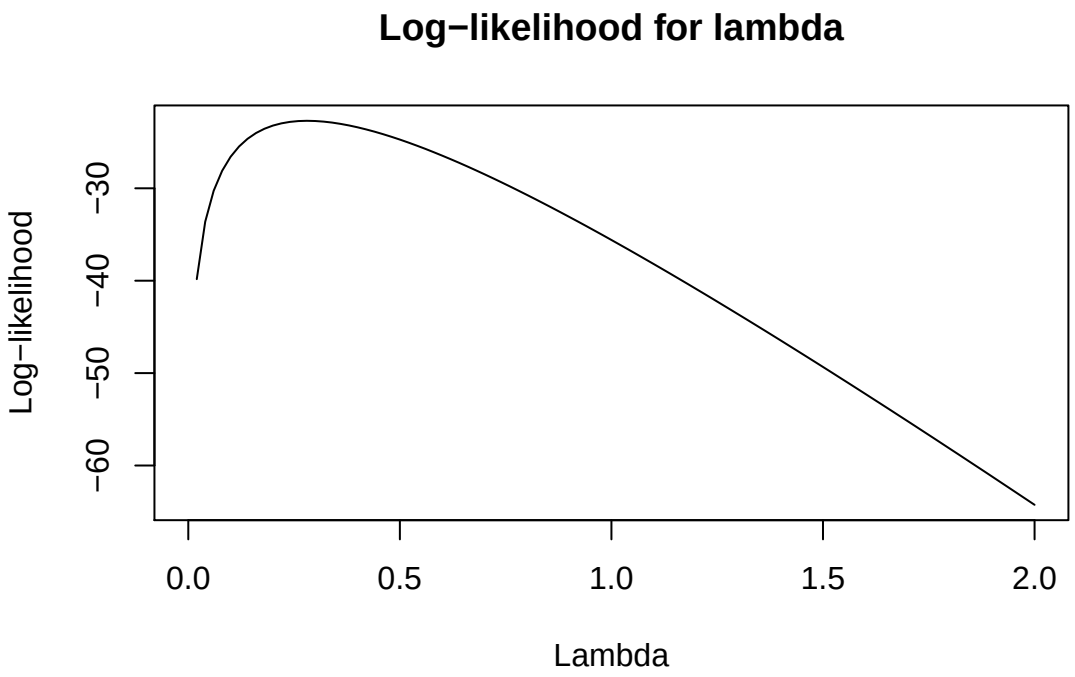
Part b)

```
# Returns log-likelihood for different values of lambda, using observed values
ell <- function(lambda,obs) {
  n <- length(obs)
  n*log(lambda)-lambda*n*mean(xobs) # Log-likelihood function for exponential distribution
}
```

Part c)

```
# Generate 101 equally seperated values between 0 & 2
lvals <- seq(from=0,to=2,length=101)

# Plot log-likelihood value for each element of lvals, using observed values
plot(lvals,ell(lvals,xobs),type = 'l',
main = 'Log-likelihood for lambda', xlab = 'Lambda',
ylab = 'Log-likelihood')
```



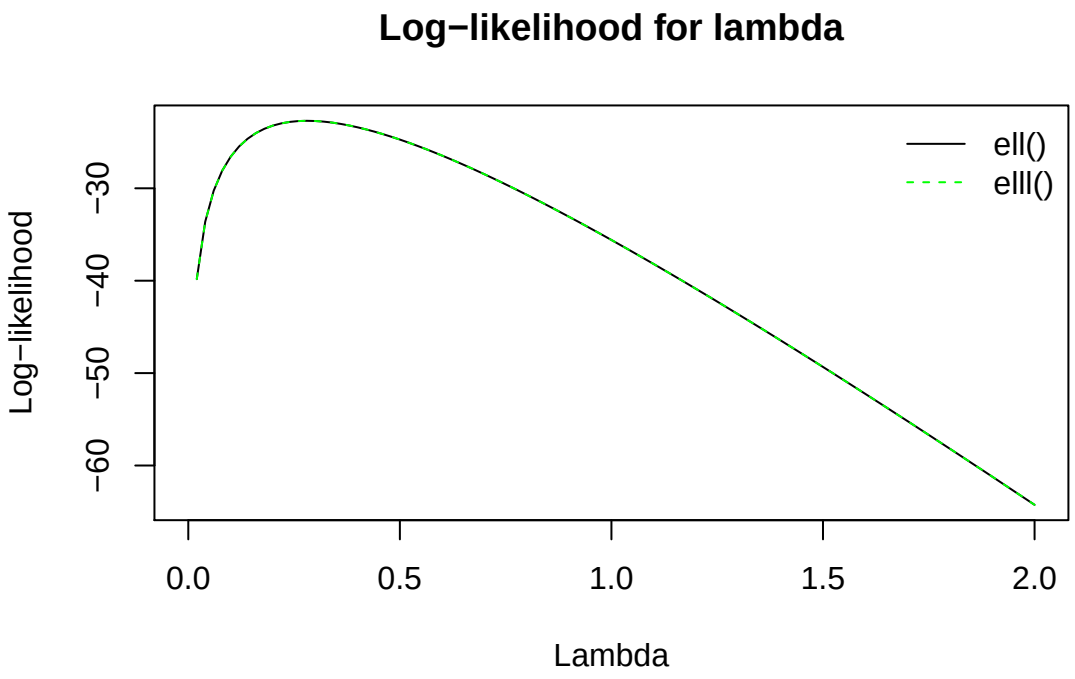
Part d)

```r
# For each element in lambda return sum of dexp for observed values
elll <- function(lambda,obs) {
  sapply(lambda, function(lv) sum(dexp(obs, rate=lv, log=TRUE)))
}

# Line produced by ell()
plot(lvals,ell(lvals,xobs),type = 'l',
main = 'Log-likelihood for lambda', xlab = 'Lambda',
ylab = 'Log-likelihood')

# Line produced by elll()
lines(lvals,elll(lvals,xobs),col="green",lty=2)

legend("topright",legend=c('ell()','elll()'),lty=c(1,2),col=c('black','green'),pch=NA,bty='n')
```



Part e)

```
x<-1:5 # [1,2,3,4,5]

# Print each element
sapply(x,function(xv) xv)
```

```
## [1] 1 2 3 4 5
```

```
# Print square of each element
sapply(x,function(xv) xv^2)
```

```
## [1]  1  4  9 16 25
```

```
# For each element, print 'foo'
sapply(x, function(xv) 'foo')
```

```
## [1] "foo" "foo" "foo" "foo" "foo"
```