# Question 4

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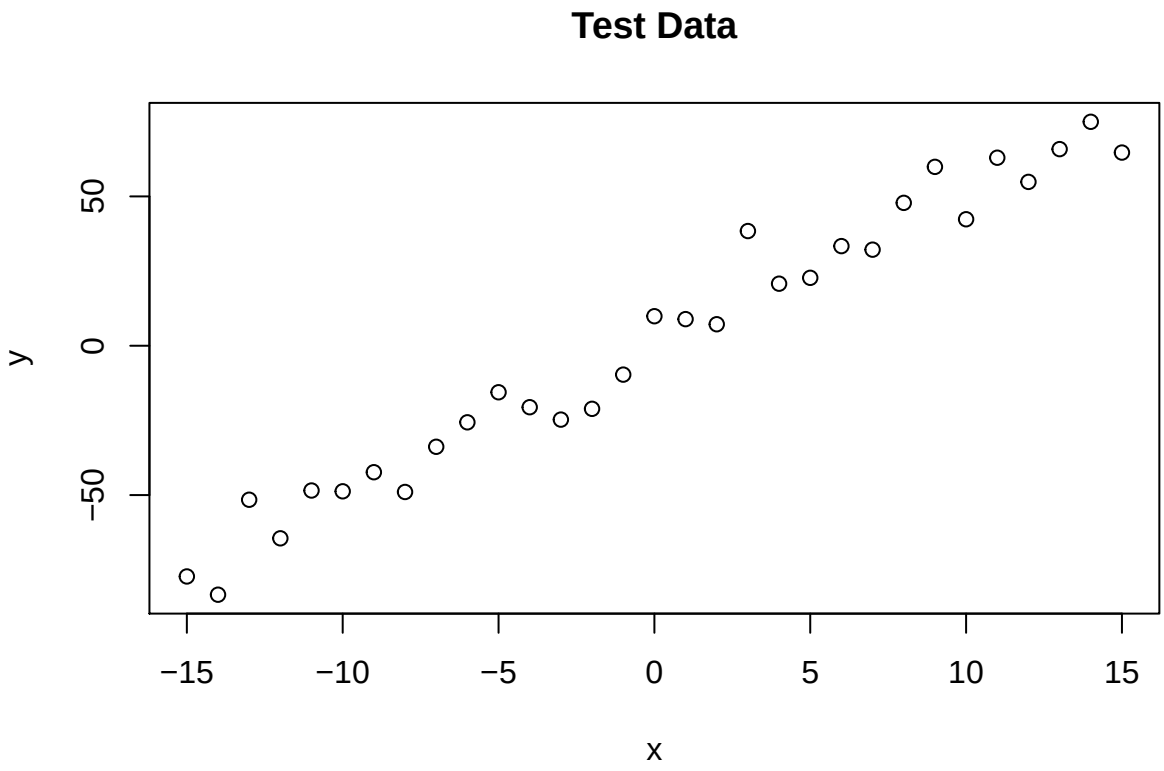
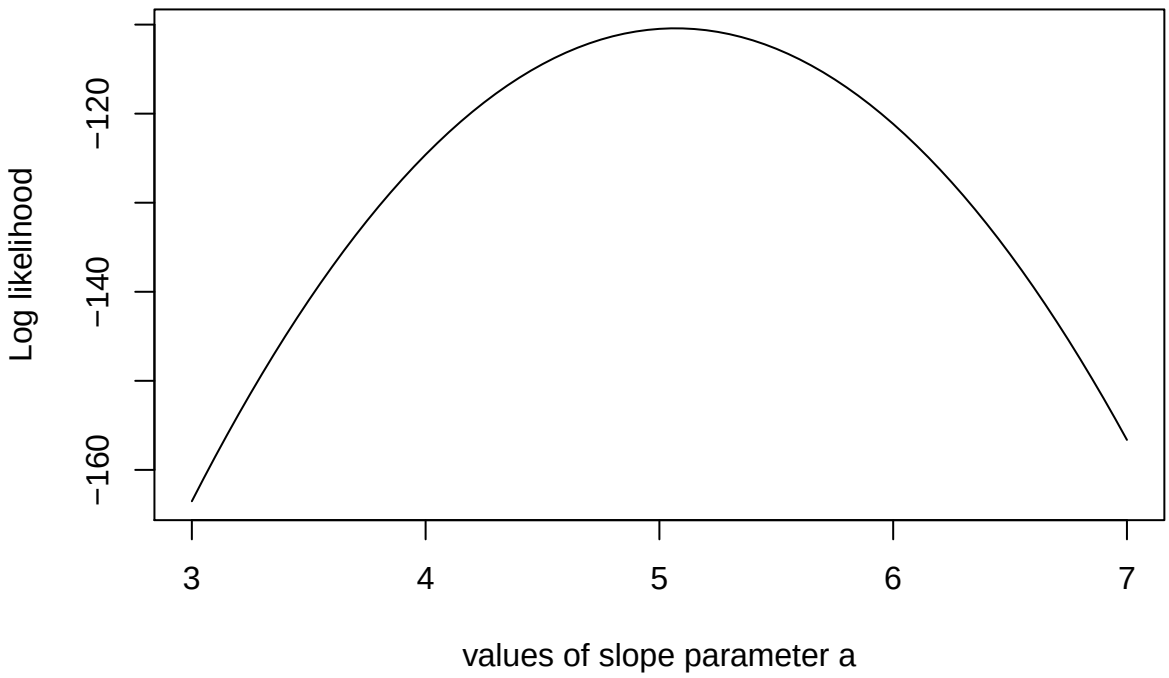
*October 12, 2017*

```
source("Source.R")
#load the Source.R file which contains all the functions we've defined
trueA <- 5
trueB <- 0
trueSd <- 10
sampleSize <- 31

# create independent x-values
x =(-(sampleSize-1)/2):((sampleSize-1)/2)
# create dependent values according to ax + b + N(0,sd)
y=trueA * x + trueB + rnorm(n=sampleSize,mean=0,sd=trueSd)
plot(x,y, main="Test Data")  #plot the test data
```



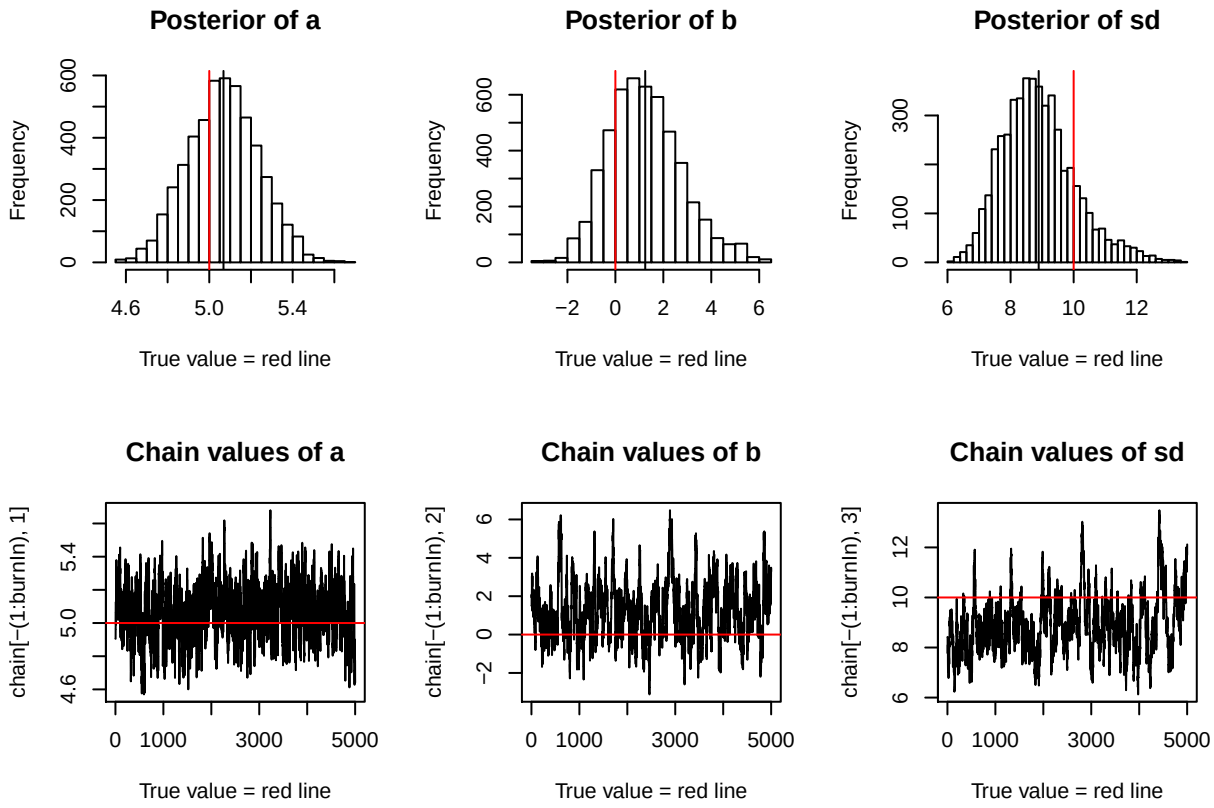

```
# Example: plot the likelihood profile of the slope a
slopevalues=function(x){return(likelihood(c(x, trueB, trueSd)))}
slopelikelihoods=lapply(seq(3, 7, by=.05), slopevalues )
plot (seq(3, 7, by=.05), slopelikelihoods , type="l",
      xlab = "values of slope parameter a", ylab = "Log likelihood")
```




```
startvalue = c(4,0,10)
chain = run_metropolis_MCMC(startvalue, 10000)

burnIn = 5000
acceptance = 1-mean(duplicated(chain[-(1:burnIn),]))

MySummary(chain,burnIn,trueA,trueB,trueSd)
```




```
# for comparison:
summary(lm(y~x))
```

```
##
## Call:
## lm(formula = y ~ x)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -13.3629  -5.1077  -0.4862   4.9983  22.2086
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   0.9806     1.5211   0.645    0.524
## x             5.0695     0.1701  29.809   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 8.469 on 29 degrees of freedom
## Multiple R-squared:  0.9684, Adjusted R-squared:  0.9673
## F-statistic: 888.6 on 1 and 29 DF,  p-value: < 2.2e-16
```