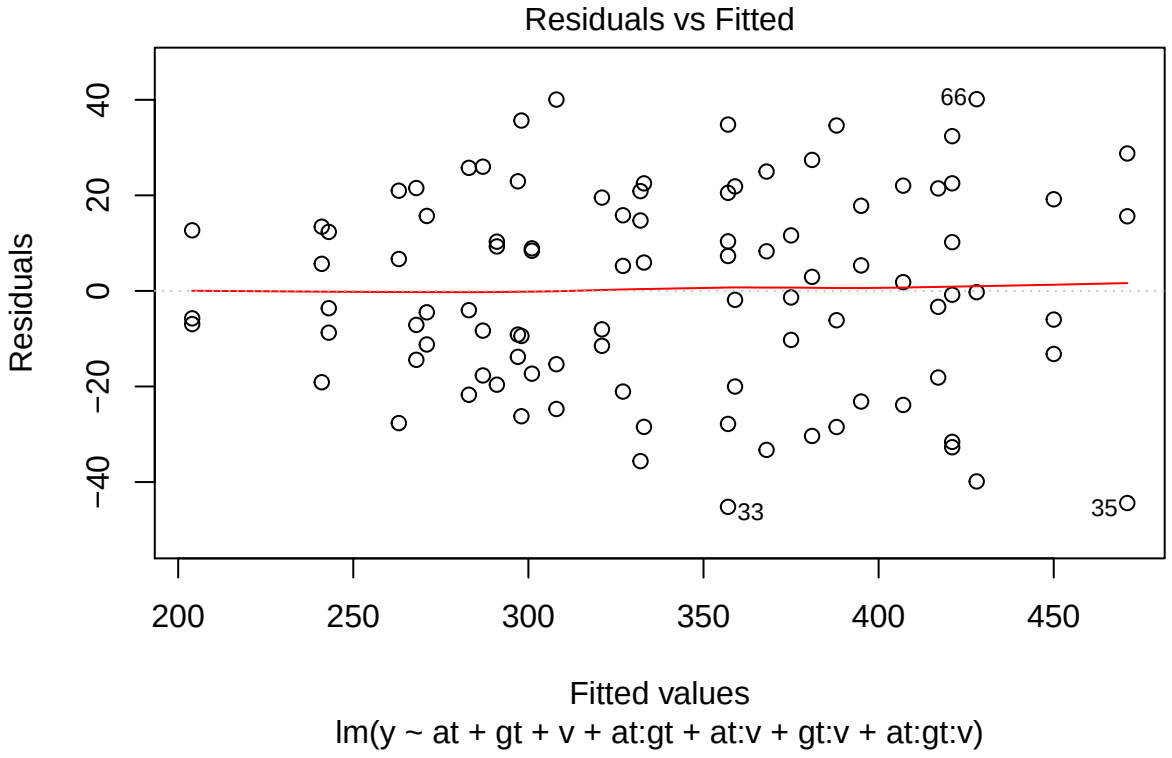
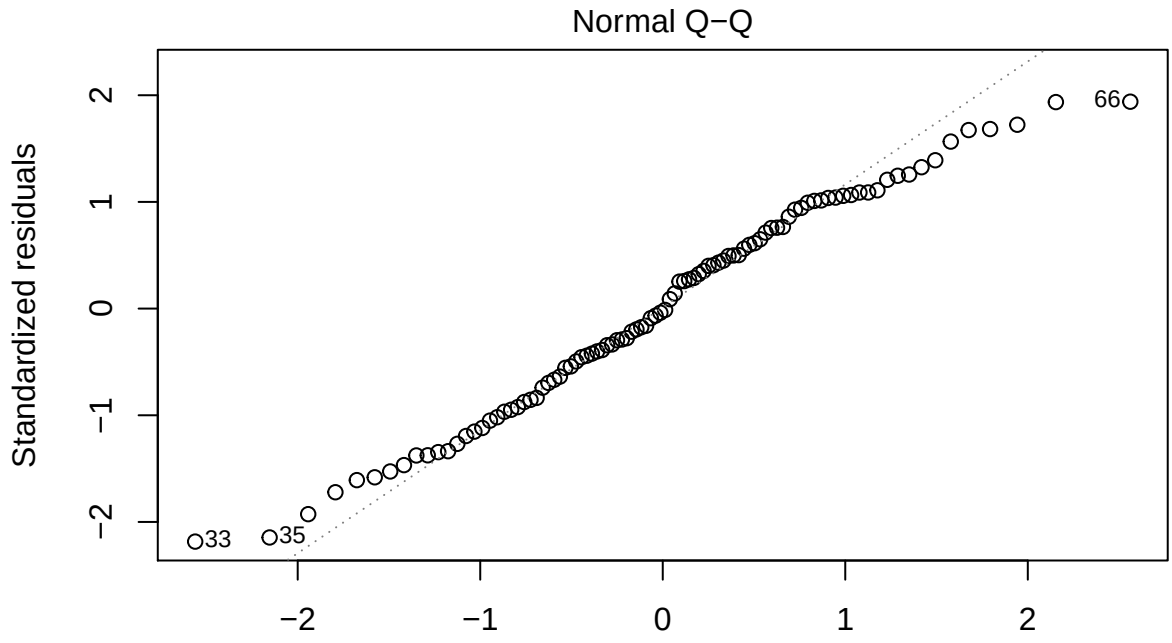
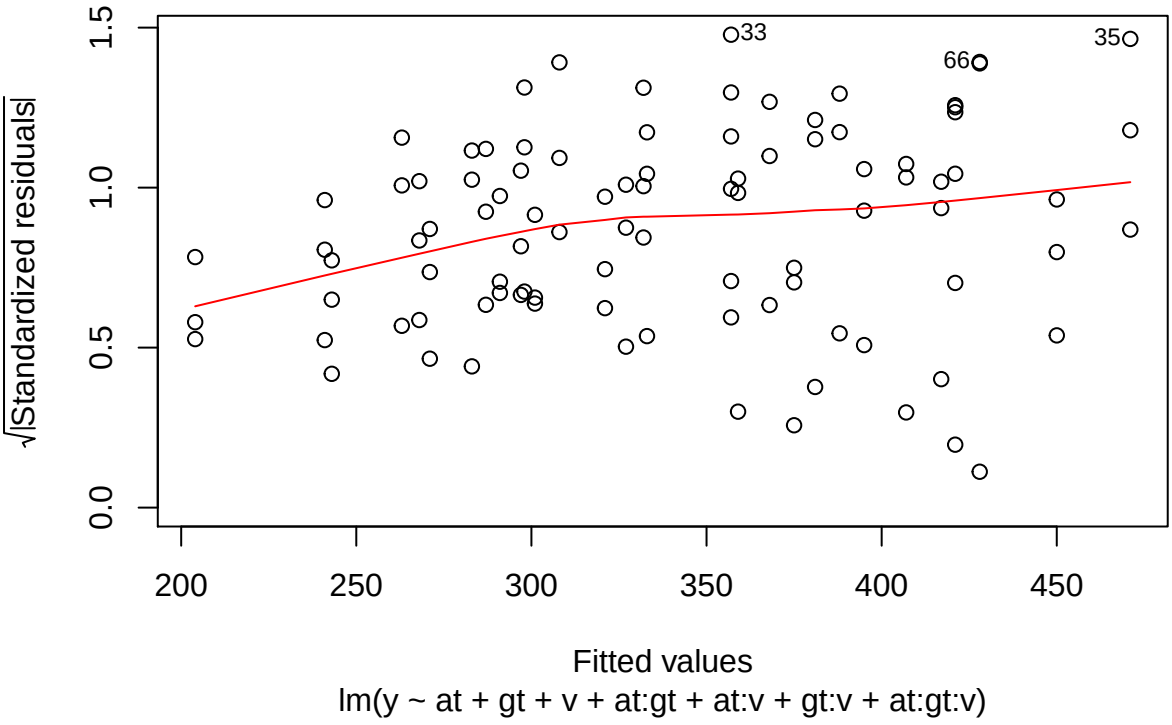
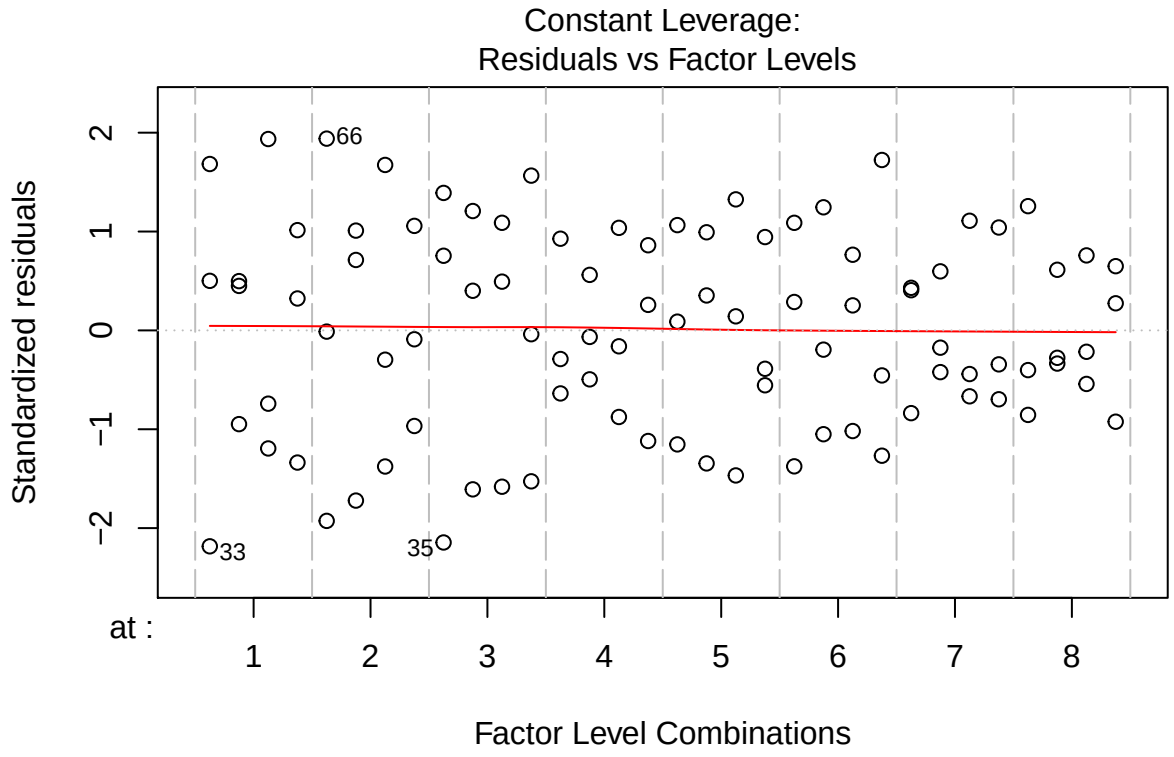
Chapter24

```
mydata = read.table(  "http://users.stat.umn.edu/~gary/book/fcdae.data/exmpl8.10", h=T)
 attach(mydata)
 at = as.factor(mydata$atemp)
 gt = as.factor(mydata$gtemp)
 v  = as.factor(mydata$variety)
  fit1 = lm(y ~ at + gt + v + at:gt + at:v + gt:v + at:gt:v)
  plot(fit1)
```

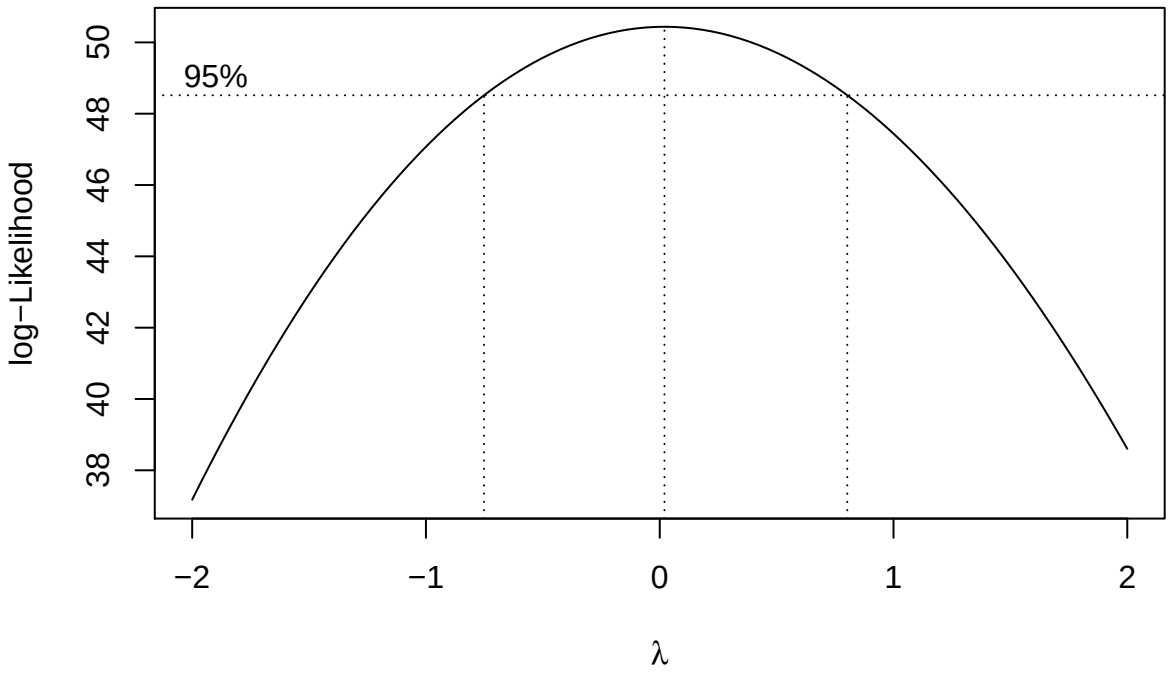



Normal Q−Q
Standardized residuals
Theoretical Quantiles
lm(y ~ at + gt + v + at:gt + at:v + gt:v + at:gt:v)
33
35
66


Scale−Location
√|Standardized residuals|
Fitted values
lm(y ~ at + gt + v + at:gt + at:v + gt:v + at:gt:v)
33
66
35



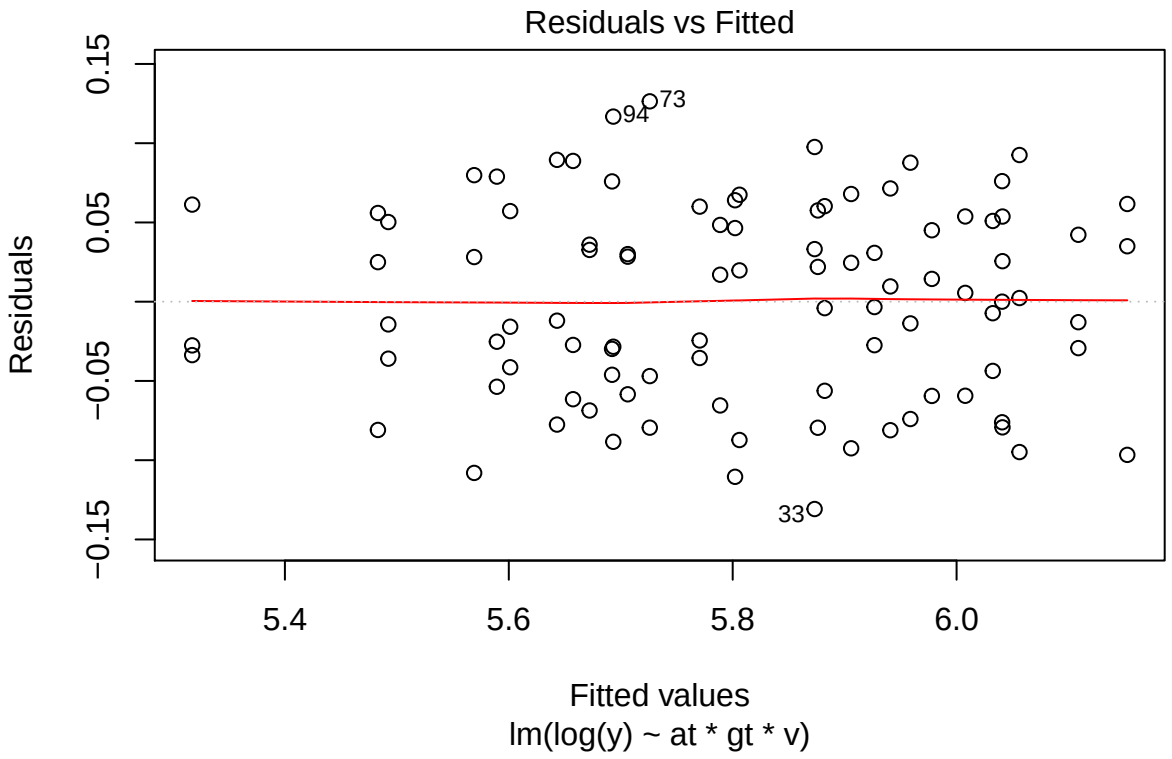

```
library(MASS)
boxcox(fit1)
```

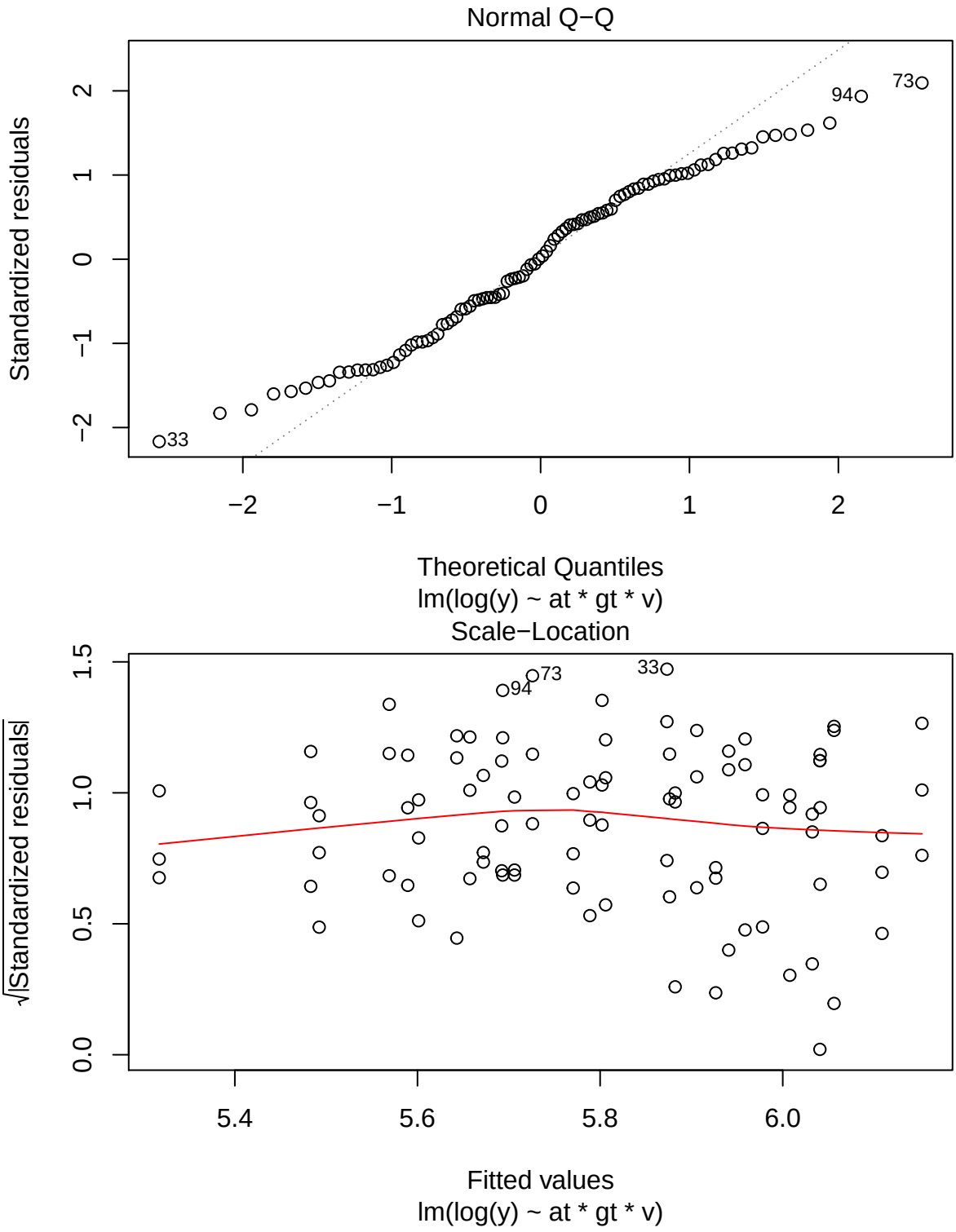


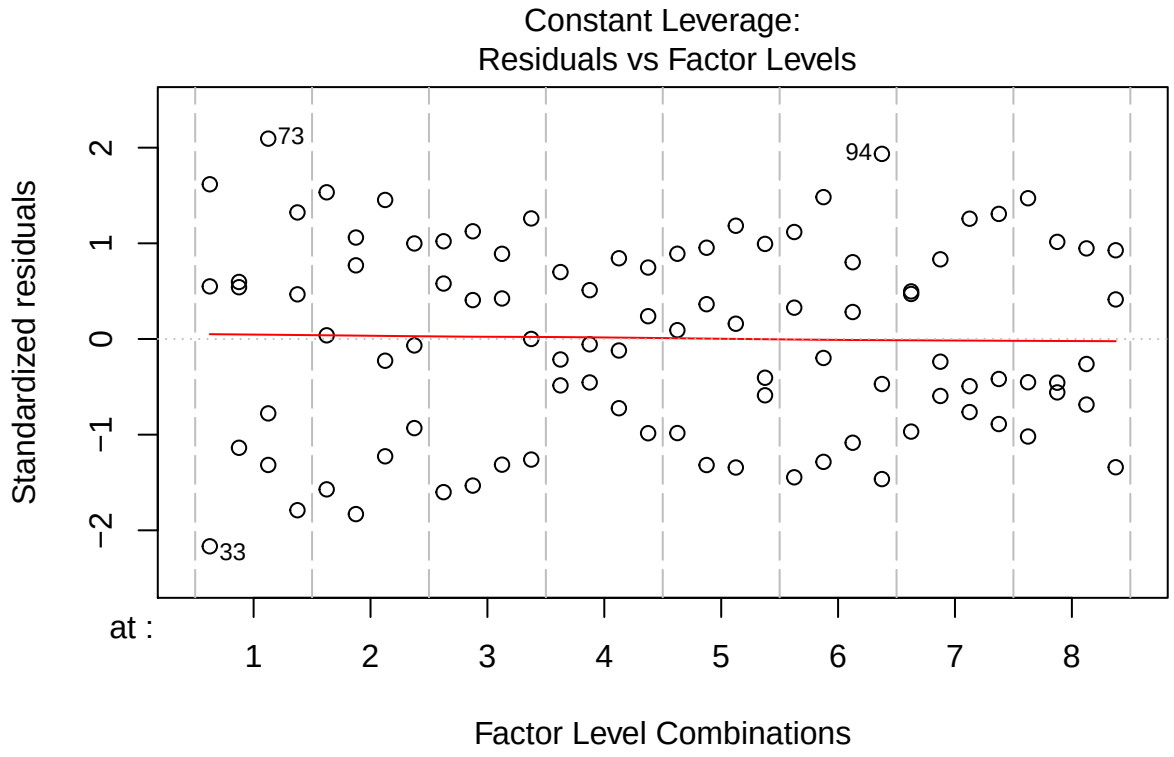

```
#Boxcox plot suggust log-transformation

logfit1 = lm(log(y) ~ at + gt + v + at:gt + at:v + gt:v + at:gt:v)
logfit1 = lm(log(y) ~ at*gt*v)
anova(logfit1)
```

```
## Analysis of Variance Table
##
## Response: log(y)
##           Df  Sum Sq Mean Sq  F value    Pr(>F)
## at         7 3.01613 0.43088  78.8628 < 2.2e-16 ***
## gt         1 0.00438 0.00438   0.8016 0.3739757
## v          1 0.58957 0.58957 107.9085 2.305e-15 ***
## at:gt      7 0.08106 0.01158   2.1195 0.0539203 .
## at:v       7 0.02758 0.00394   0.7212 0.6543993
## gt:v       1 0.08599 0.08599  15.7392 0.0001863 ***
## at:gt:v    7 0.04764 0.00681   1.2457 0.2916176
## Residuals 64 0.34967 0.00546
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

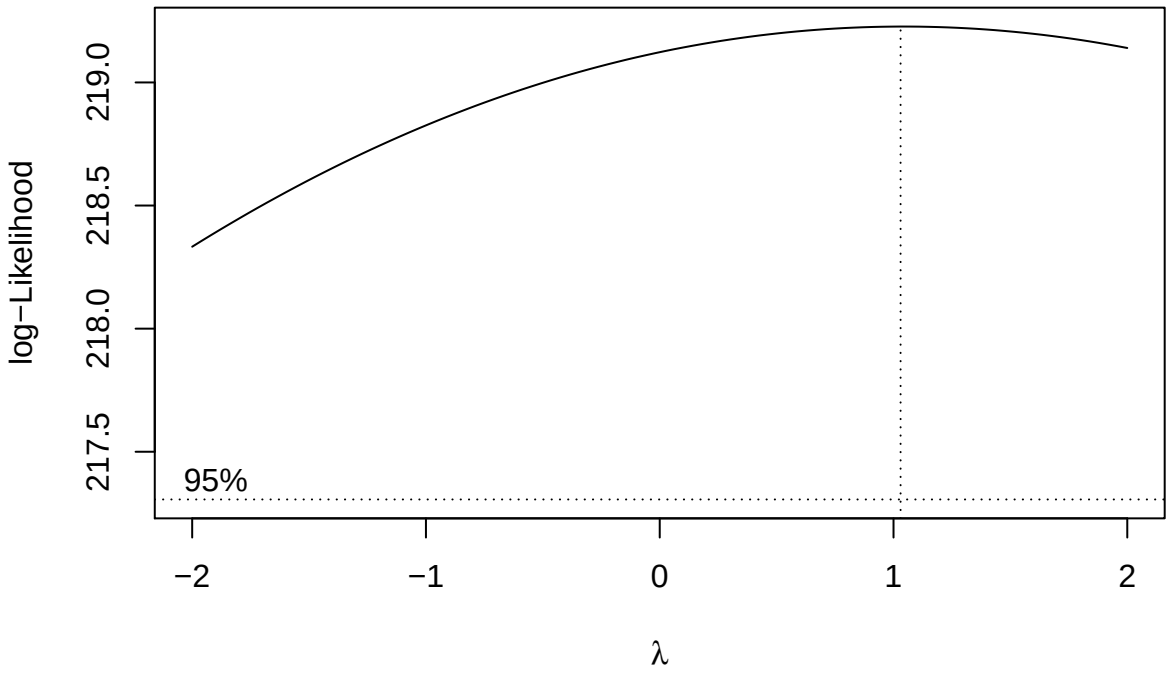
```
plot(logfit1)
```




Normal Q−Q
Standardized residuals
Theoretical Quantiles
lm(log(y) ~ at * gt * v)
Scale−Location
√|Standardized residuals|
Fitted values
lm(log(y) ~ at * gt * v)
33
94
73




```
boxcox(logfit1)
```

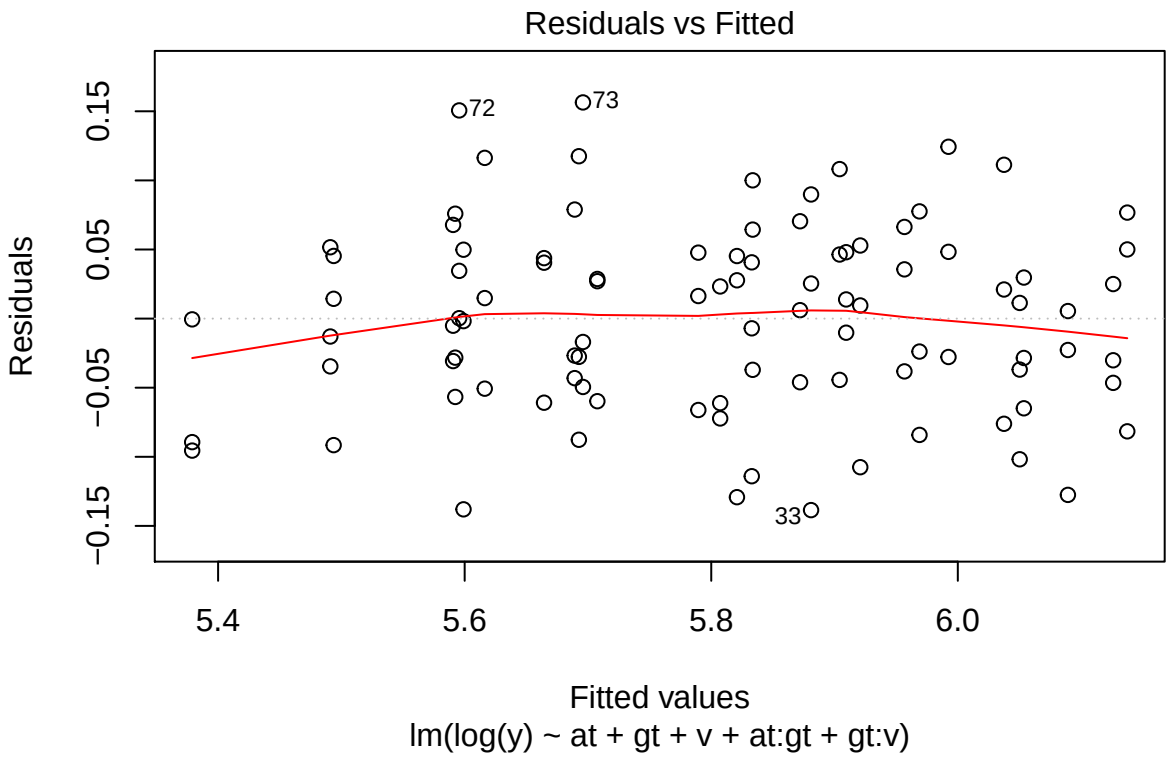


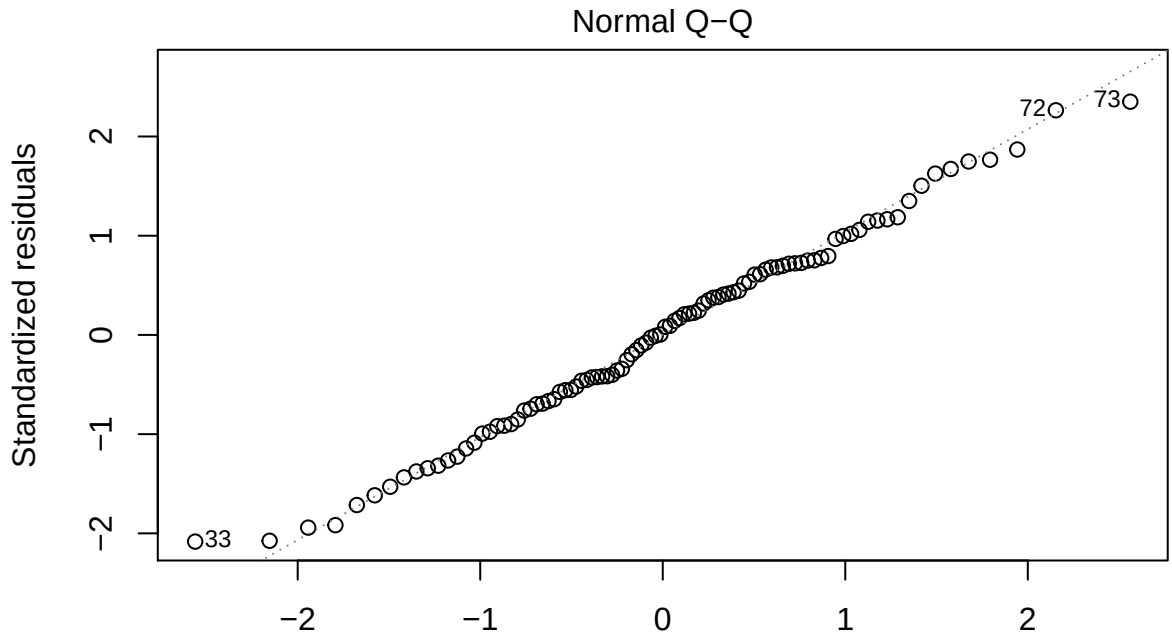

```
logfit2 = lm(log(y) ~ at + gt + v + at:gt + gt:v)
anova(logfit2)
```

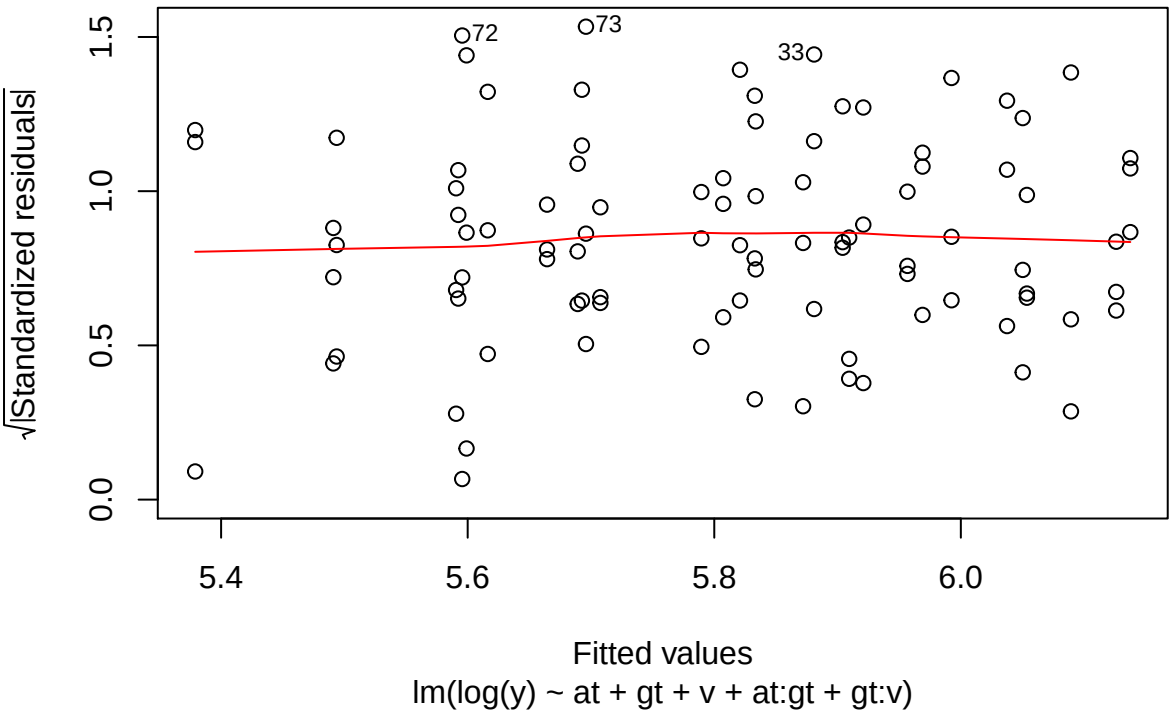
```
## Analysis of Variance Table
##
```

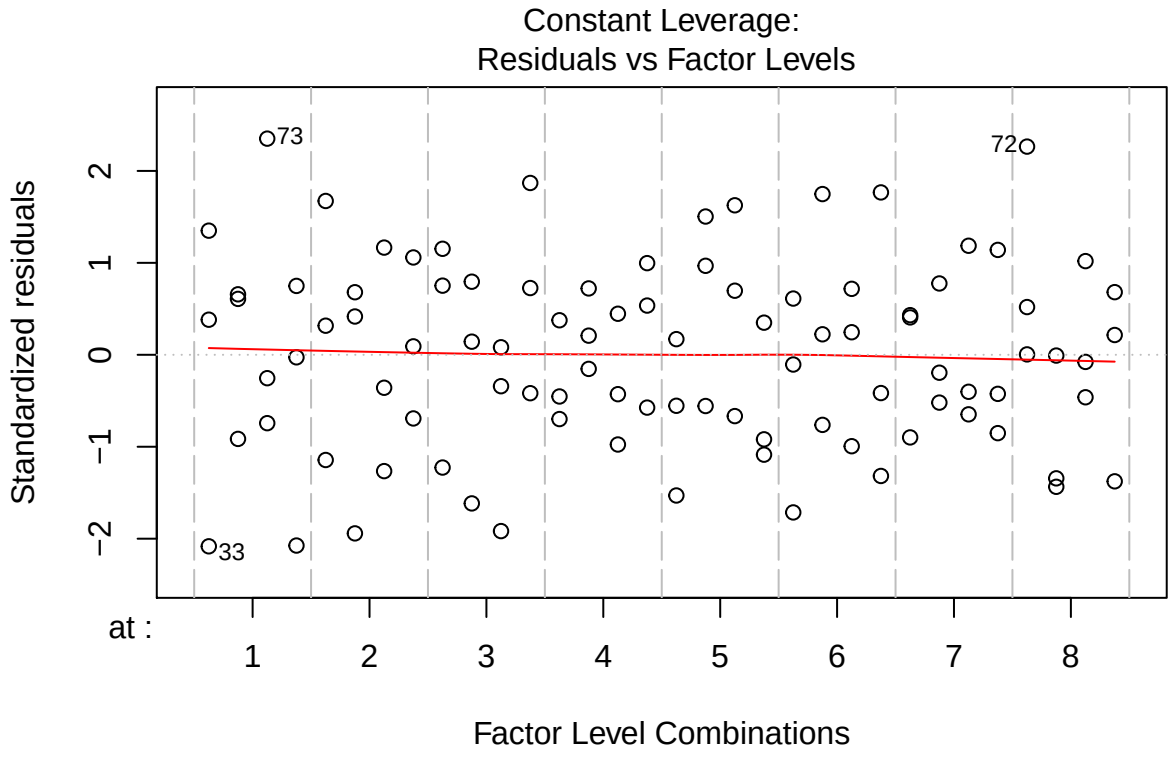
```
## Response: log(y)
##           Df  Sum Sq Mean Sq  F value    Pr(>F)
## at         7 3.01613 0.43088  79.0981 < 2.2e-16 ***
## gt         1 0.00438 0.00438   0.8040 0.3726670
## v          1 0.58957 0.58957 108.2305 < 2.2e-16 ***
## at:gt      7 0.08106 0.01158   2.1258 0.0503809 .
## gt:v       1 0.08599 0.08599  15.7861 0.0001571 ***
## Residuals 78 0.42489 0.00545
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
plot(logfit2)
```




Normal Q−Q
Standardized residuals
Theoretical Quantiles
lm(log(y) ~ at + gt + v + at:gt + gt:v)
33
72
73


Scale−Location
√|Standardized residuals|
Fitted values
lm(log(y) ~ at + gt + v + at:gt + gt:v)
33
72
73




```
anova(logfit2,logfit1)
```

```
## Analysis of Variance Table
##
## Model 1: log(y) ~ at + gt + v + at:gt + gt:v
## Model 2: log(y) ~ at * gt * v
##   Res.Df     RSS Df Sum of Sq      F Pr(>F)
## 1     78 0.42489
## 2     64 0.34967 14  0.075223 0.9834 0.4801
```