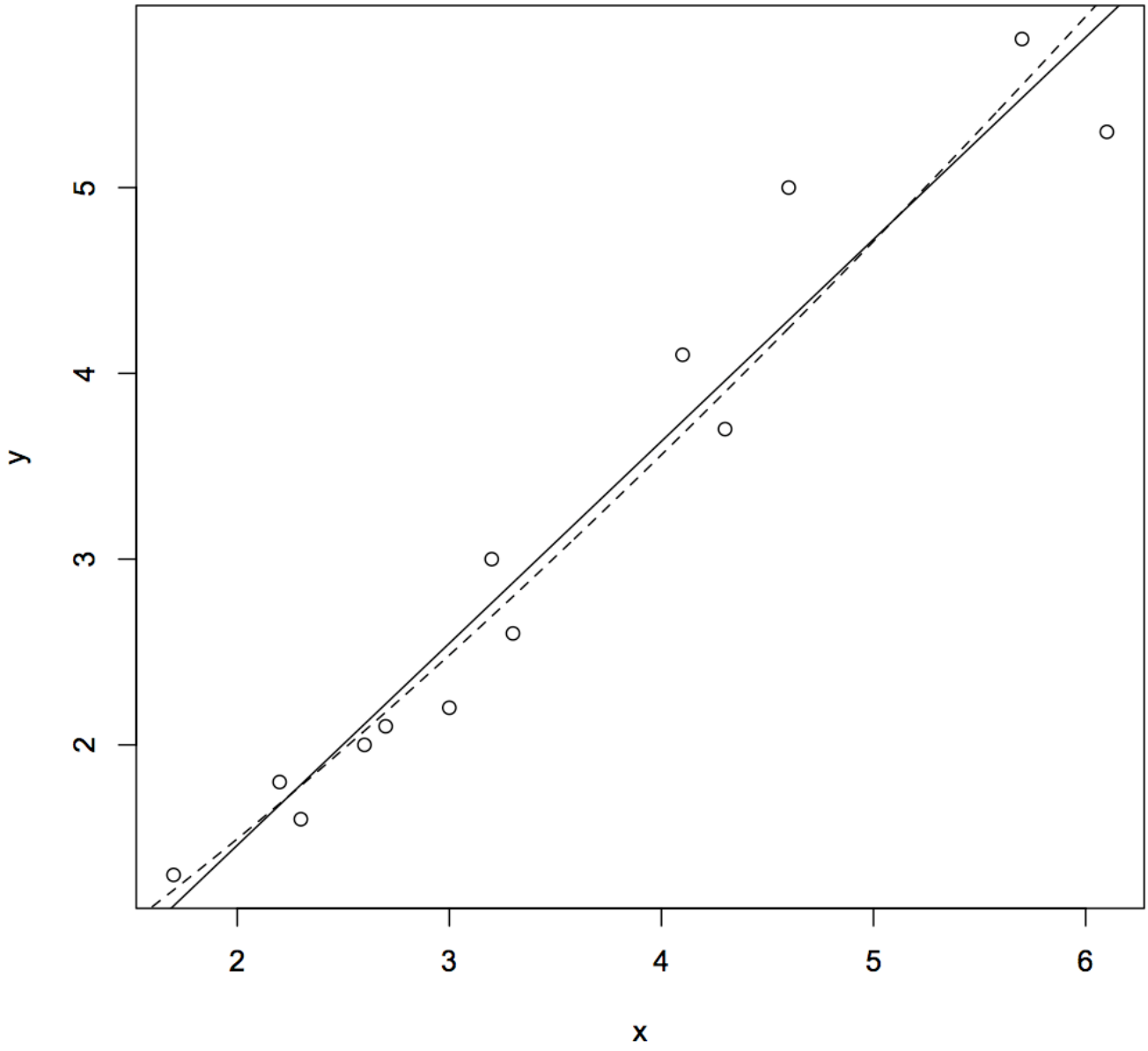
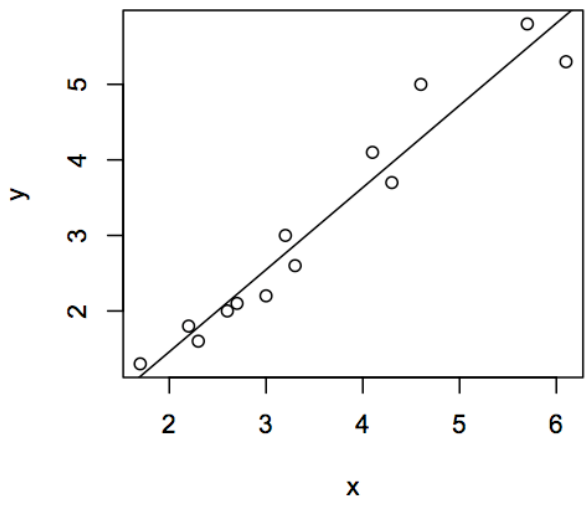
```
# math 3080 - 1 Treibergs  Feb. 15   2010
#
# from Devore ex 13.17
# from "Some Burning Characteristics of Filter paper"
# (Combustion Science and Technology   1971)
#  x = mass rate of burning
#  y = flame length
#
"x"  "y"
1.7  1.3
2.2  1.8
2.3  1.6
2.6  2.0
2.7  2.1
3.0  2.2
3.2  3.0
3.3  2.6
4.1  4.1
4.3  3.7
4.6  5.0
5.7  5.8
6.1  5.3
```

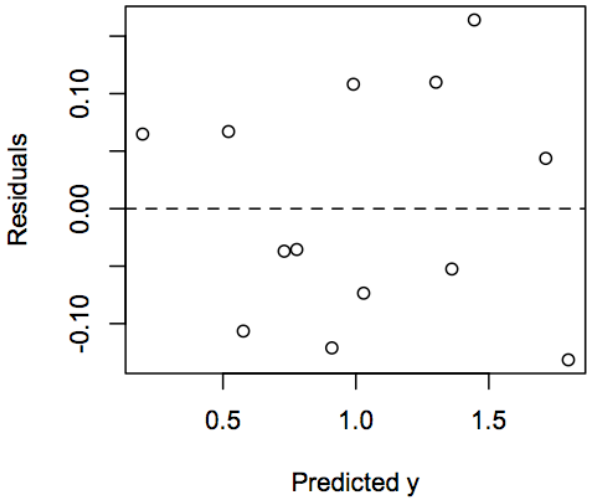
```
R version 2.10.1 (2009-12-14)
Copyright (C) 2009 The R Foundation for Statistical Computing
ISBN 3-900051-07-0
> pp <- read.table("M3081dataPaper.txt",header=TRUE)
> pp
     x   y
1  1.7 1.3
2  2.2 1.8
3  2.3 1.6
4  2.6 2.0
5  2.7 2.1
6  3.0 2.2
7  3.2 3.0
8  3.3 2.6
9  4.1 4.1
10 4.3 3.7
11 4.6 5.0
12 5.7 5.8
13 6.1 5.3
```

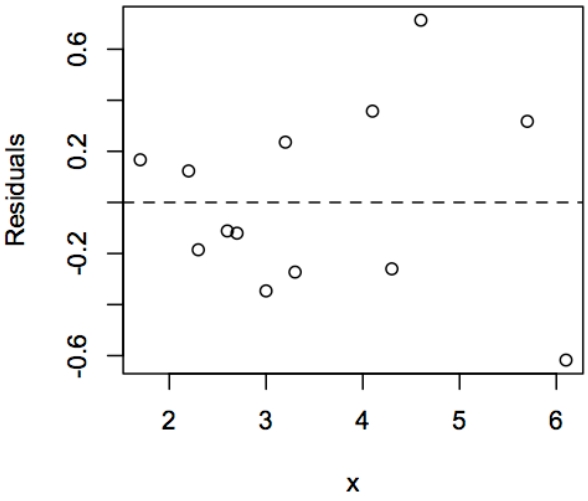
```
> fit1 <- lm(y ~ x); summary(fit1); anova(fit1); abline(fit1)

Call:
lm(formula = y ~ x)

Residuals:
    Min      1Q  Median      3Q     Max
-0.6174 -0.2602 -0.1117  0.2359  0.7136

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  -0.7155     0.2997  -2.387    0.036 *
x             1.0874     0.0798  13.626 3.12e-08 ***
---
Signif. codes:  0 *** 0.001 ** 0.01 * 0.05 . 0.1   1

Residual standard error: 0.3743 on 11 degrees of freedom
Multiple R-squared: 0.9441,Adjusted R-squared: 0.939
F-statistic: 185.7 on 1 and 11 DF,  p-value: 3.119e-08

Analysis of Variance Table

Response: y
          Df  Sum Sq Mean Sq F value    Pr(>F)
x          1 26.0156 26.0156  185.67 3.119e-08 ***
Residuals 11  1.5413  0.1401
---
Signif. codes:  0 *** 0.001 ** 0.01 * 0.05 . 0.1   1

> lx <- log(x); ly <- log(y)
> fit2 <- lm(ly ~ lx); summary(fit2); anova(fit2); abline(fit2)

Call:
lm(formula = ly ~ lx)

Residuals:
     Min       1Q   Median       3Q      Max
-0.13147 -0.07352 -0.03554  0.06703  0.16406

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) -0.46762    0.09669  -4.836 0.000522 ***
lx           1.25356    0.07752  16.172 5.15e-09 ***
---
Signif. codes:  0 *** 0.001 ** 0.01 * 0.05 . 0.1   1

Residual standard error: 0.1024 on 11 degrees of freedom
Multiple R-squared: 0.9596,Adjusted R-squared: 0.956
F-statistic: 261.5 on 1 and 11 DF,  p-value: 5.151e-09
```

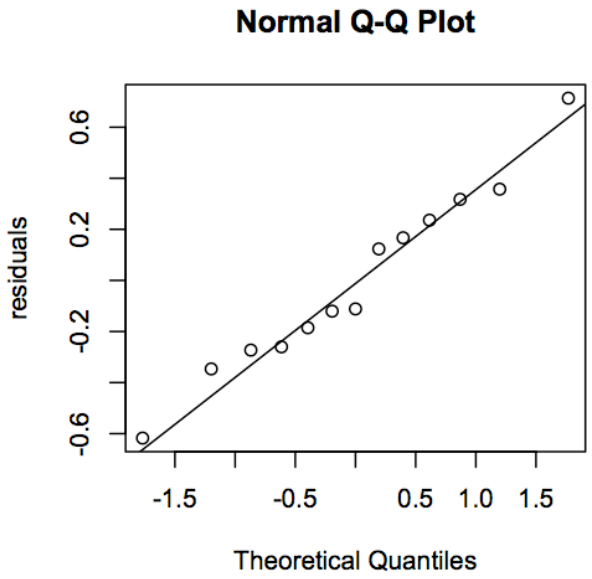
```
Analysis of Variance Table

Response: ly
          Df  Sum Sq Mean Sq F value    Pr(>F)
lx         1 2.74280 2.74280  261.53 5.151e-09 ***
Residuals 11 0.11536 0.01049
---
Signif. codes:  0 *** 0.001 ** 0.01 * 0.05 . 0.1   1


> layout(matrix(1:4,ncol=2))
> plot(lx,ly);abline(fit2)
> plot(lx,fit2$residuals,ylab="Residuals",xlab="log(x)")
> plot(fit2$fitted.values,fit2$residuals,ylab="Residuals",xlab="Predicted y")
> qqnorm(fit2$residuals,ylab="residuals"); qqline(fit2$residuals)

> b0 <- fit2$coefficients[[1]]; b0
[1] -0.4676194
> b1 <- fit2$coefficients[[2]]; b1
[1] 1.253556
> xx <- seq(from = 1.6, to = 6.2, by=.01)
> eb0 <- exp(b0)
> yy <- eb0 * xx^b1
> plot(x,y);abline(fit1);lines(xx,yy,lty=2)
```

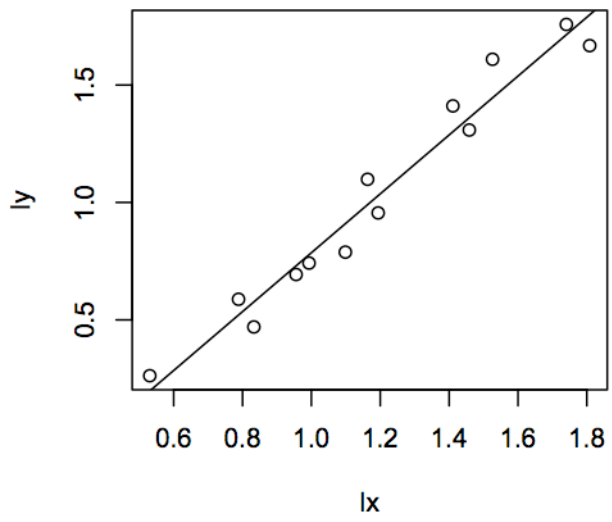

y
x
2
3
4
5
6
2
3
4
5

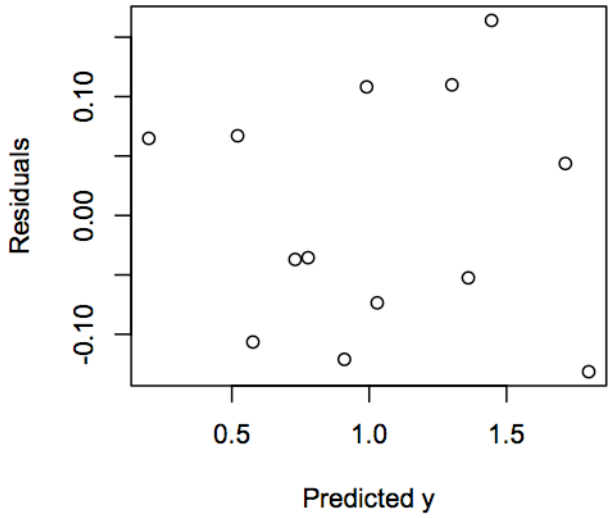

y
x
2
3
4
5
6

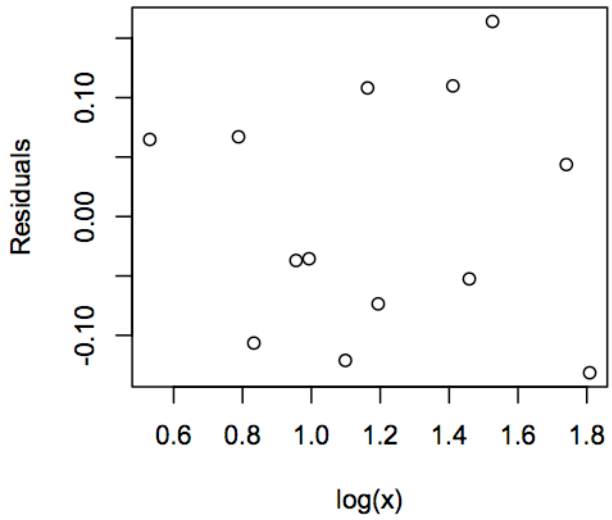

Residuals
Predicted y
-0.10
0.00
0.10
0.5
1.0
1.5

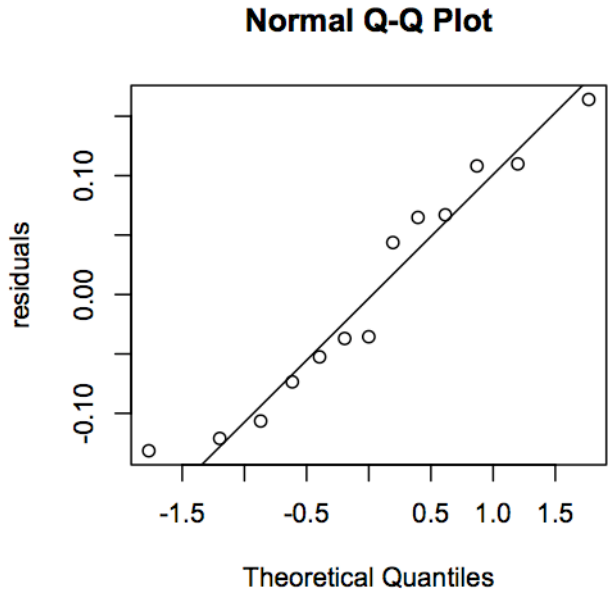

Residuals
x
-0.6
-0.2
0.2
0.6
2
3
4
5
6


Normal Q-Q Plot
residuals
Theoretical Quantiles
-0.6
-0.2
0.2
0.6
-1.5
-0.5
0.5
1.0
1.5


ly
lx
0.5
1.0
1.5
0.6
0.8
1.0
1.2
1.4
1.6
1.8


Residuals
Predicted y
-0.10
0.00
0.10
0.5
1.0
1.5


Residuals
log(x)
-0.10
0.00
0.10
0.6
0.8
1.0
1.2
1.4
1.6
1.8


Normal Q-Q Plot
residuals
Theoretical Quantiles
-0.10
0.00
0.10
-1.5
-0.5
0.5
1.0
1.5