

1 Prelims

some random stuff

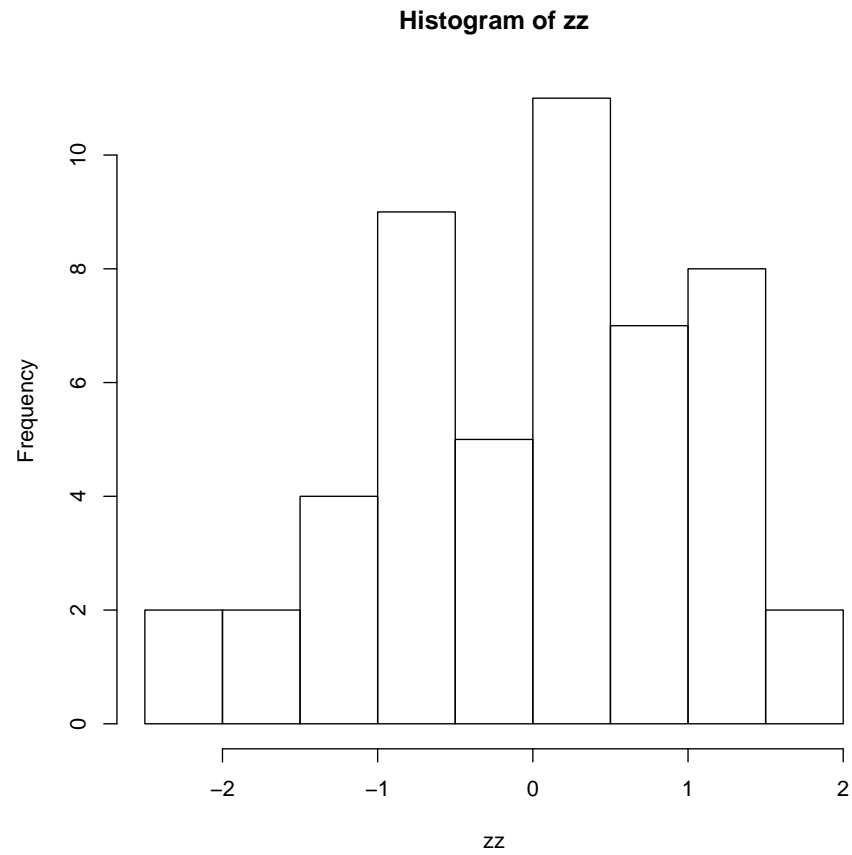
```
set.seed(457299)
zz = rnorm(50)
zz

## [1]  1.621867 -0.746347 -0.268931 -0.699535  0.213238  0.708969 -1.078329
## [8]  0.791310  0.004047  1.095880 -1.655475 -1.206874  1.268749  0.838393
## [15] -0.746106  0.052754  1.514875 -0.112309  0.266535 -1.720378  1.160779
## [22]  0.471877  0.944608 -0.807258  0.279189  0.686444  0.607642  0.071344
## [29] -0.154486 -1.177612  0.012286 -0.644232  1.402745 -0.865977  1.324755
## [36]  1.468643  1.196363  1.434646 -0.579221  0.378457 -0.166149 -0.644332
## [43] -2.158476 -1.158178  0.519148 -0.996153 -0.112549  0.203055 -2.051010
## [50]  0.083032
```

2 Plots

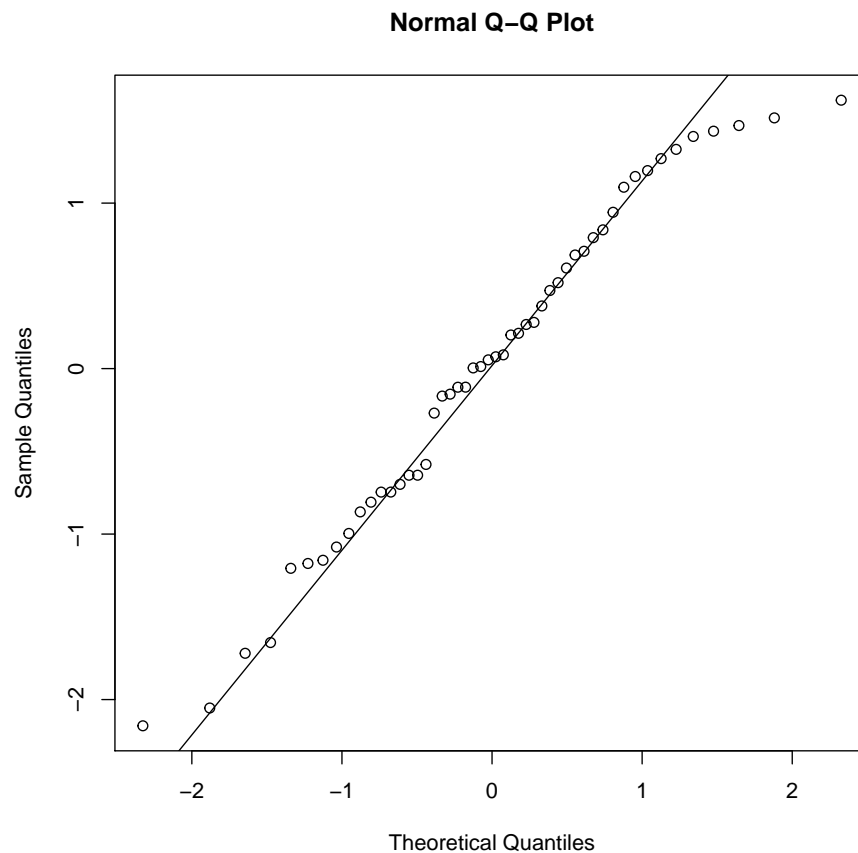
histogram

```
hist(zz)
```



normal quantile plot

```
qqnorm(zz)  
qqline(zz)
```



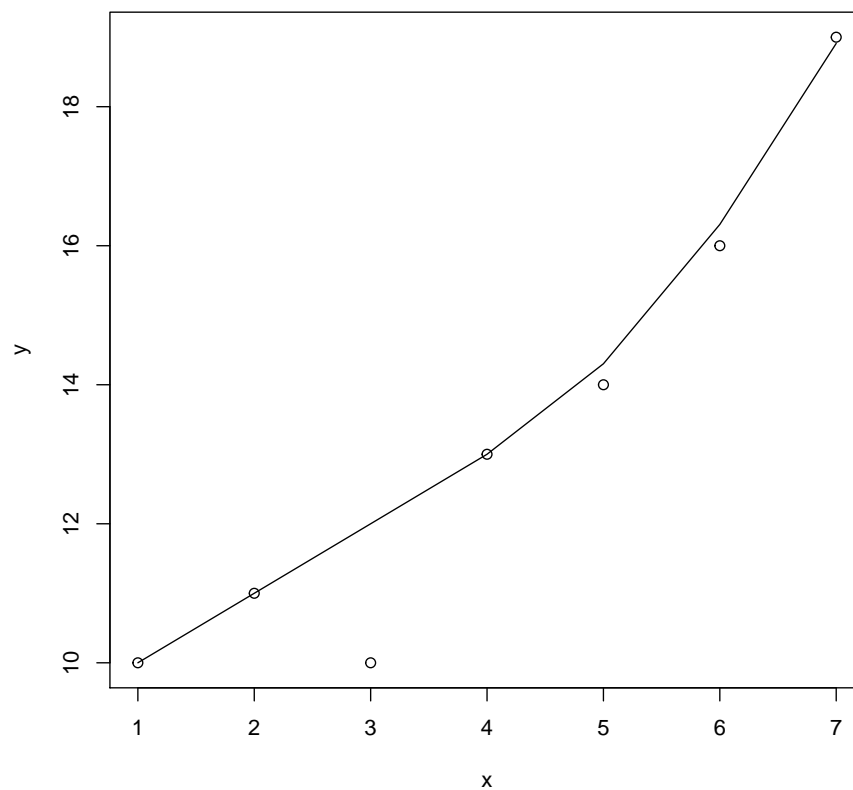
3 More experimentation

Some more data:

```
x = 1:7  
y = c(10, 11, 10, 13, 14, 16, 19)
```

Scatterplot, with lowess

```
plot(y ~ x)  
lines(lowess(y ~ x))
```



Regression:

```
y.1 = lm(y ~ x)
summary(y.1)
```

```
##
## Call:
## lm(formula = y ~ x)
##
## Residuals:
```

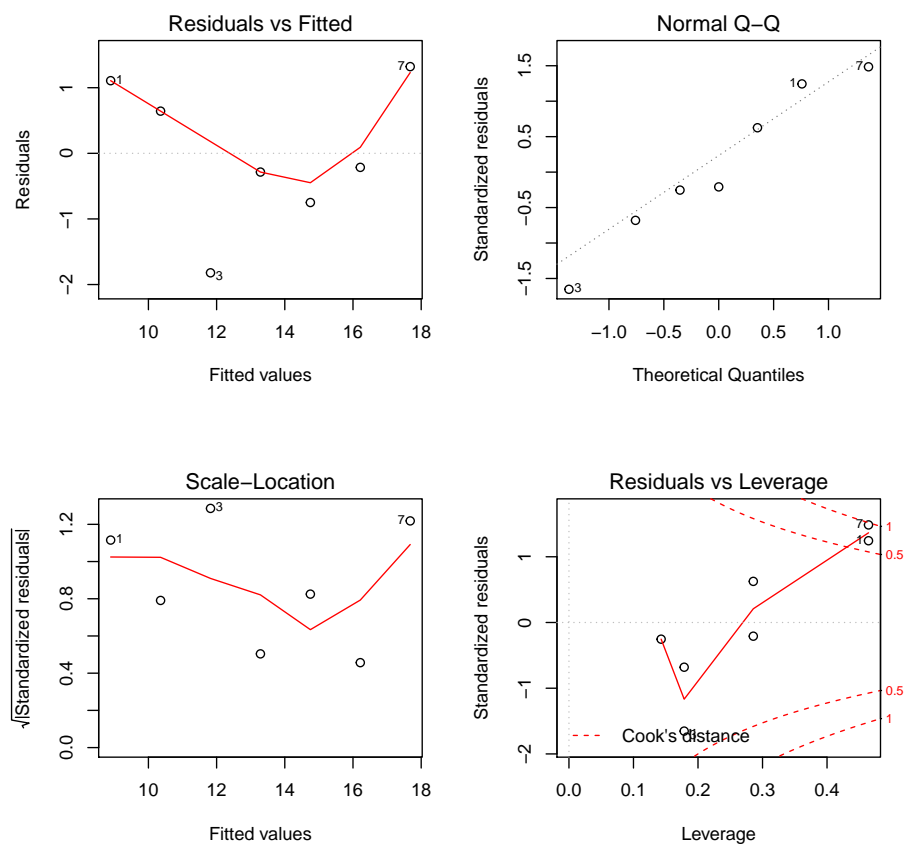
	1	2	3	4	5	6	7
##	1.107	0.643	-1.821	-0.286	-0.750	-0.214	1.321

```
##
## Coefficients:
```

	Estimate	Std. Error	t value	Pr(> t)
## (Intercept)	7.43	1.03	7.23	0.00079 ***
## x	1.46	0.23	6.37	0.00141 **

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.22 on 5 degrees of freedom
## Multiple R-squared:  0.89, Adjusted R-squared:  0.868
## F-statistic: 40.6 on 1 and 5 DF, p-value: 0.00141

par(mfrow = c(2, 2))
plot(y.1)
```



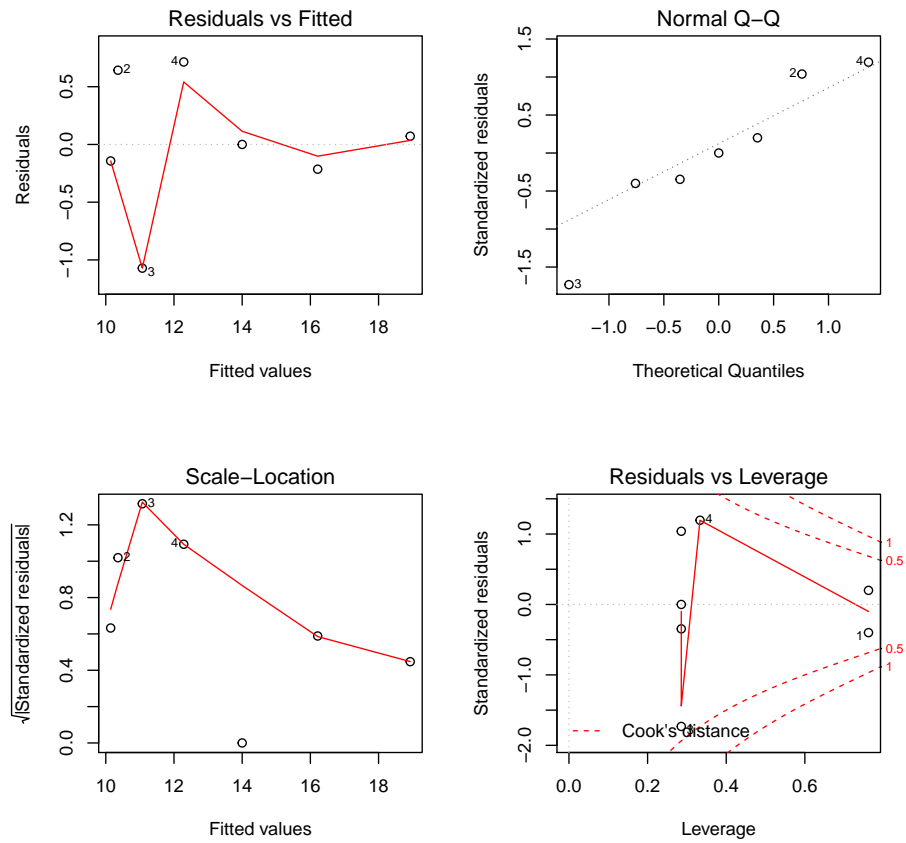
There's a hint of curvature there. Does adding x^2 help?

```
y.2 = lm(y ~ poly(x, 2))
summary(y.2)

##
## Call:
```

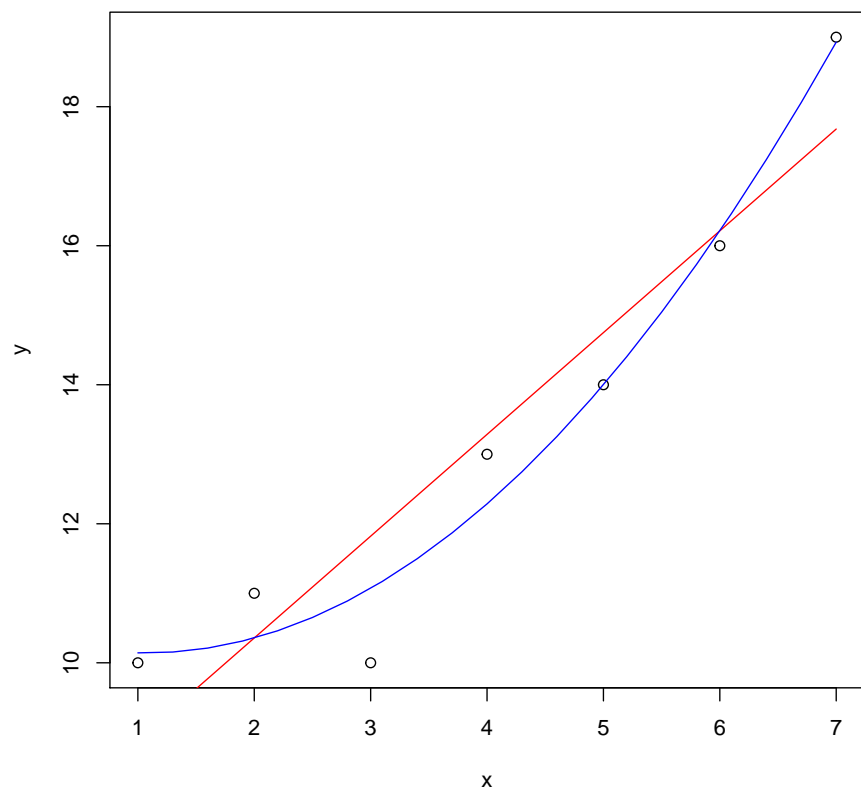
```
## lm(formula = y ~ poly(x, 2))
##
## Residuals:
##          1          2          3          4          5          6          7
## -1.43e-01  6.43e-01 -1.07e+00  7.14e-01  8.25e-16 -2.14e-01  7.14e-02
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   13.286      0.277   48.02  1.1e-06 ***
## poly(x, 2)1    7.748      0.732   10.59  0.00045 ***
## poly(x, 2)2    2.291      0.732    3.13  0.03517 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.732 on 4 degrees of freedom
## Multiple R-squared:  0.968, Adjusted R-squared:  0.952
## F-statistic: 60.9 on 2 and 4 DF,  p-value: 0.00101

par(mfrow = c(2, 2))
plot(y.2)
```



I think it does. Scatterplot of original data with linear and quadratic trends?

```
plot(y ~ x)
lines(x, fitted(y.1), col = "red")
lines(spline(x, fitted(y.2)), col = "blue")
```



It looks as if the blue curve describes the data better than the red line.