

Regression!

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1.

- a. Fit the simple linear regression of colonies on dose, and produce the usual R diagnostic plots.
- b. Using the plots, comment on (i) any evidence of lack of fit and (ii) any evidence of heteroscedasticity.
- c. Now fit the simple linear regression of colonies on $\log(\text{dose}+1)$, and produce the usual R diagnostic plots.
- d. Produce a summary of the regression results.
- e. Produce an ANOVA table of the regression results.

The following R code may be helpful:

```
library(faraway)
```

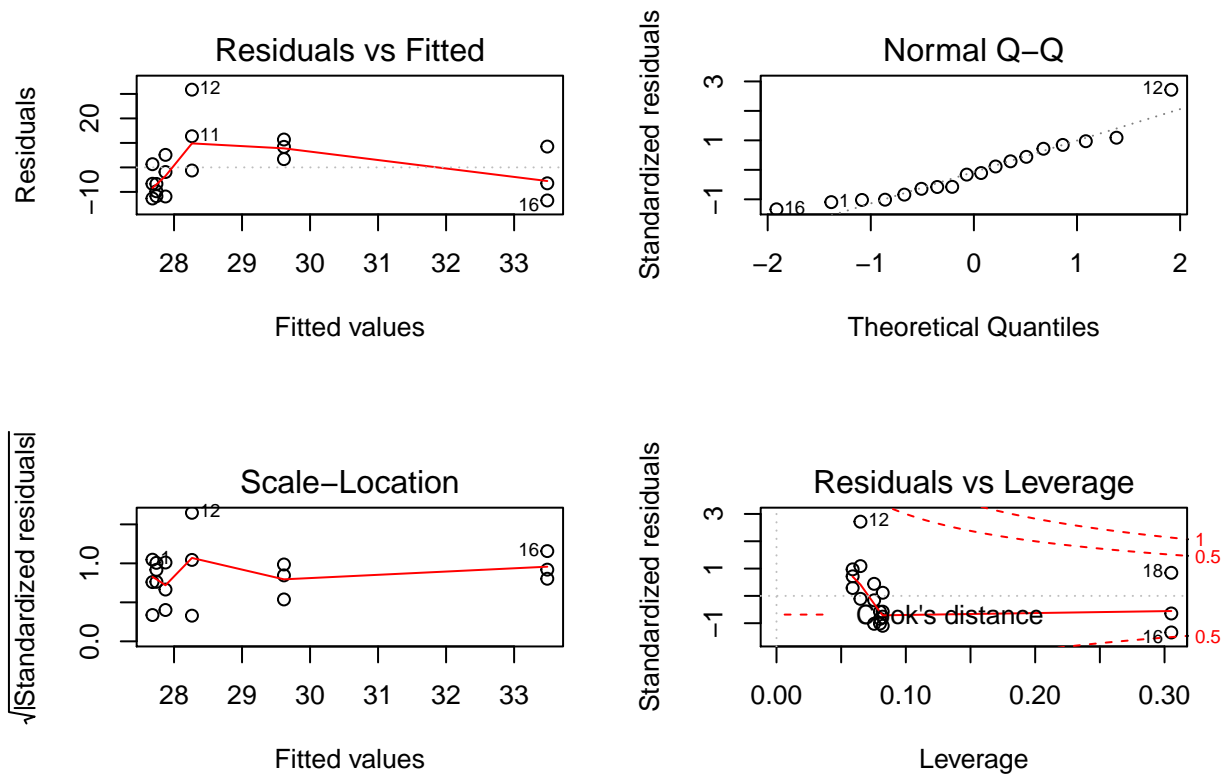
```
## Warning: package 'faraway' was built under R version 3.1.2
```

```
data(salmonella)
```

```
mod <- lm(colonies~dose,data=salmonella)
```

```
par(mfrow=c(2,2))
```

```
plot(mod)
```



```
par(mfrow=c(1,1))
```

f. For this model, compute a t-test by hand for the slope using the standard error formula.

$$S_{\hat{\beta}_1} = \sqrt{\frac{MSE}{\sum_i (x_i - \bar{x})^2}}$$

g. Calculate and interpret a 95% confidence interval for the intercept. The equation for the standard error is given below.

$$S_{\hat{\beta}_0} = \sqrt{MSE} \sqrt{1/n + \frac{\bar{x}^2}{\sum_i (x_i - \bar{x})^2}}$$

h. Calculate the coefficient of determination for the model by hand.

$$R^2 = \frac{SSR}{SST}$$

i. Calculate the correlation coefficient for the model.

$$r = \sqrt{R^2}$$

j. Carry out a hypothesis test to determine whether the linear correlation for these data is different from 0.

$$t_{calc} = \frac{r * \sqrt{n-2}}{\sqrt{1-r^2}}$$