source("http://www.math.montana.edu/parker/courses/STAT411/diagANOVA.r")

# Get data and plot it
d=read.csv("http://www.math.montana.edu/parker/courses/STAT411/Claims.CSV")
summary(d)

## claim.rate Avg.Temp
## Min. :0.3677 Min. :35.5
## 1st Qu.:1.5646 1st Qu.:48.9
## Median :2.2247 Median :62.3
## Mean :2.4875 Mean :58.7
## 3rd Qu.:3.1608 3rd Qu.:70.1
## Max. :6.5290 Max. :78.0

plot(log(claim.rate) ~ Avg.Temp,data=d)

# Fit the SLR
m=lm(log(claim.rate) ~ Avg.Temp,data=d)
summary(m)

## Call:
## lm(formula = log(claim.rate) ~ Avg.Temp, data = d)
## 
## Residuals:
##     Min       1Q   Median       3Q      Max
## -1.88792 -0.31131  0.07795  0.35662  1.07377
##
## Coefficients: Estimate Std. Error t value Pr(>|t|)
## (Intercept) 2.367725  0.239561  9.884 4.99e-16 ***
## Avg.Temp   -0.027564  0.003988 -6.912 6.65e-10 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.488 on 90 degrees of freedom
## Multiple R-squared:  0.3468, Adjusted R-squared:  0.3395
## F-statistic: 47.78 on 1 and 90 DF,  p-value: 6.648e-10

abline(2.37,-0.028)
# Get a prediction at 35F
m.s35=lm(log(claim.rate) ~ I(Avg.Temp-35),data=d)
summary(m.s35)

So the fitted model is

\[
\text{Mean}\{\ln(\text{claim rate|temperature})\} = 2.37 - 0.028\text{temperature}
\]

where \(y\) is the monthly insurance claim rate per 100 employees and \(x\) is temperature (F).
In this sample of size n=92, correlation of the residuals in the qq-plot is r=0.979128

## Find the equation of the negative exponential

$$\exp(\text{coef}(m))$$

So the fitted model after exponentiating both sides of the equation is

$$\text{Median}\{\text{claimsrate}\,|\,\text{temperature}\} = 10.67e^{-0.028\text{temperature}}$$
plot(claim.rate ~ Avg.Temp, data=d)
temp=35:80
lines(temp, 10.67*exp(-.028*temp))

A 95% CI for $C$, which is an estimate of the median number of claims at 0F (which is very tenuous due to extrapolation!) is found by:

```r
confint(m)
```

```
# 2.5 % 97.5 %
# (Intercept) 1.89179444 2.84365494
# Avg.Temp  -0.03548644 -0.01964186
exp(c(1.89179444, 2.84365494))
```

```
# [1] 6.631257 17.178437
```