Regression Models: Assignment 1

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Importing libraries

```
library(dplyr)
```

Exercise 1

Simulation

```
sim = list()
for (j in 1:1000) {
    vals = c()
    for (i in 1:100) {
        run = 3 + 3*cos(i/10 + 50) + rnorm(1, mean=0, sd=1)
        vals = c(vals, run)
    }
    sim[[j]] = vals
}
sim
```

Exercise 2

Importing the data

```
d <- data.frame(read.table('../data/index.txt', header=TRUE))
```

```
X = d$PovPct
Y = d$Brth15to17
beta1 = cov(X, Y)/var(X)
beta0 = mean(Y) - beta1*mean(X)
beta1
```

```
## [1] 1.373345
```

```
beta0
```

```
## [1] 4.267293
```

Exercise 3

First we have the log-likelihood function for β and σ^2

$l(\sigma^2|X) = \sum_{i=1}^{n} log(\frac{1}{\sqrt{2\pi\sigma^2}} - \frac{(Y_i-(\beta_0+\beta 1 x_{ik}+\cdots+\beta_k x_{ik}))^2}{2\sigma^2})$