Exercise 4

Read in and create data

```
#Access the data:
a <- read.table("http://www.stat.ucla.edu/~nchristo/statistics_c173_c273/jura.txt", head
er=TRUE)

#Rename the variables:
y <- a$Pb

x1 <- a$Cd
x2 <- a$Co
x3 <- a$Cr
x4 <- a$Cu
x5 <- a$Ni
x6 <- a$Zn

#Full regression:
ones <- rep(1, nrow(a))
#create matrix X
X <- as.matrix(cbind(ones,x1, x2, x3, x4, x5, x6))
#solve for beta hat
beta_hat <- solve(t(X) %*% X) %*% t(X) %*% y

#define X1 and X2 for partial regression
X1 <- as.matrix(cbind(ones, x1, x2, x3, x4))
X2 <- as.matrix(cbind(x5, x6))

#define H1 and y star
H1 <- X1 %*% solve(t(X1) %*% X1) %*% t(X1)
y_star <- (diag(nrow(a)) - H1) %*% y

#define x2 star and solve for beta2 hat
X2_star <- (diag(nrow(a)) - H1) %*% X2
beta2_hat <- solve(t(X2_star) %*% X2_star) %*% t(X2_star) %*% y_star

beta2_hat
```

```
##          [,1]
## x5 0.4855964
## x6 0.3004051
```

```
beta_hat
```

```
##              [,1]
## ones 18.9100703
## x1    -1.5192122
## x2    -1.3608686
## x3    -0.1439250
## x4     0.9771788
## x5     0.4855964
## x6     0.3004051
```

```
#define x(o)
X0 <- as.matrix(cbind(x1, x2, x3, x4, x5, x6))
#find the mean sweeper matrix
mean_sweeper <- (diag(nrow(a)) - (1/nrow(a)) * as.matrix(cbind(rep(1, nrow(a)))) %*% as.
matrix(rbind(rep(1, nrow(a)))))

#find x(o) star and y star
X0_star <- (mean_sweeper %*% X0)
Y_star <- mean_sweeper %*% y

#solve for beta(o) hat
B0_hat <- solve(t(X0_star) %*% X0_star) %*% t(X0_star) %*% Y_star


B0_hat
```

```
##              [,1]
## x1 -1.5192122
## x2 -1.3608686
## x3 -0.1439250
## x4  0.9771788
## x5  0.4855964
## x6  0.3004051
```

```
#define X1 and X2
X1 <- as.matrix(cbind(ones, x1, x2))
X2 <- as.matrix(x3)

#Find H1
H1 <- X1 %*% solve(t(X1) %*% X1) %*% t(X1)
#find y star and x2_star
y_star <- (diag(nrow(a)) - H1) %*% y
X2_star <- (diag(nrow(a)) - H1) %*% X2

#solve for beta2 hat
beta2_hat <- solve(t(X2_star) %*% X2_star) %*% t(X2_star) %*% y_star
beta2_hat
```

```
##              [,1]
## [1,] 0.5134709
```