STATS 790 Assignment 3

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Question 1

ESL Chapter 5 Figure 5.6 is replicated, the code is shown as below.

```r
# Question 1
# Replicate ESL Chapter 5 Figure 5.6

# Import dataset
bone <- read.table('https://hastie.su.domains/ElemStatLearn/datasets/bone.data',
                   header = TRUE)

# According to ESL Figure 5.6 description, spnbmd is the target variable
# and age is the predictor.
colnames(bone)
```

```
## [1] "idnum"  "age"    "gender" "spnbmd"
```

```r
# Plot the age against relative change in spinal BMD, color separated by gender.
plot(x = bone$age, y = bone$spnbmd,
     col = ifelse(bone$gender == 'female','red','blue'),
     pch = 20, xlab = 'Age', ylab = 'Relative Change in Spinal BMD')

# Split male and female.
male_bone <- bone[bone$gender == 'male', ]
female_bone <- bone[bone$gender == 'female', ]

# Spline, using degree of freedom = 12 (given by the textbook)
male_spline <- smooth.spline(x = male_bone$age, y = male_bone$spnbmd, df = 12)
```
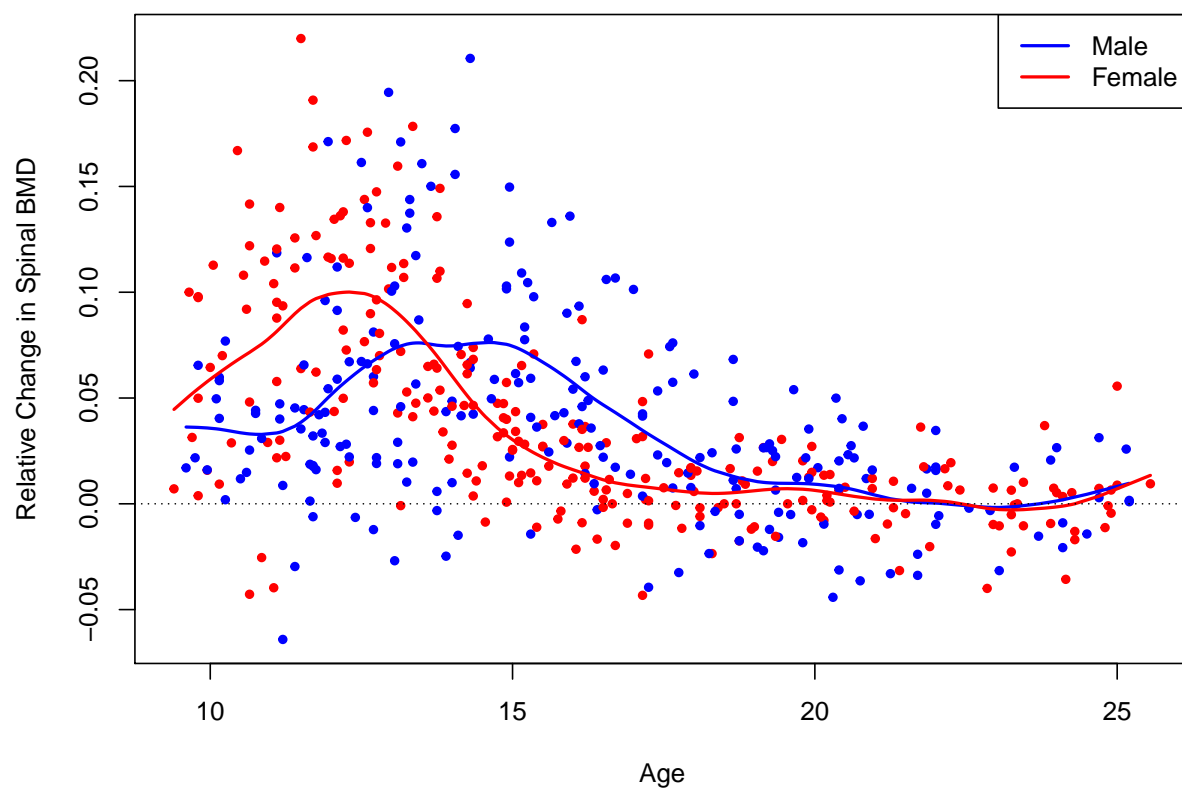
```
female_spline <- smooth.spline(x = female_bone$age, y = female_bone$spnbmd, df = 12)


# Add splines to the graph with corresponding color for each gender.
lines(male_spline, col = 'blue', lwd = 2)
lines(female_spline, col = 'red', lwd = 2)


# Add a horizontal dash line at y = 0.
abline(h=0, lty=3)


# Add a legend at the top right corner.
legend(x='topright', legend=c('Male', 'Female'),
       col=c('blue', 'red'), lwd=2)
```

Question 2 (South Africa coronary heart disease data)

Question 3 (..)

Question 4

ESL 5.4

ESL 5.13