Sample quiz

A. Matrix exercises

Suppose we define $\mathbb{A}$ and $\mathbb{B}$ as follows,

A

```
##      [,1] [,2]
## [1,]    0    3
## [2,]    1    2
## [3,]   -2   -2
```

B

```
##      [,1] [,2]
## [1,]    1    0
## [2,]   -2    1
```

Calculate the matrices returned by following r command:

1. A %*% B

2. t(A)

3. solve(B)

B. Summation exercises

1. Calculate $\sum_{i=k}^{k+5}(i+3)$

2. Calculate $\frac{d}{dm}\sum_{i=1}^{n}(y_i - mx_i)^2$ (Note: This kind of differentiation question will not be tested in the quiz, though we think it is a good practise for lab)

C. R exercises

Which of the following code successfully construct the matrix $\mathbb{A} = \begin{bmatrix} 1 & 1 \\ 2 & 2 \\ 3 & 3 \end{bmatrix}$

A. A <- matrix(c(1,1,2,2,3,3) ,nrow=3)

B. A <- cbind(c(1,1),c(2,2),c(3,3))

C. A <- t(matrix(c(1,1,2,2,3,3) ,nrow=2))

D. A <- c(c(1:3),c(1:3))

D. Fitting a linear model by least squares

We look at the uswage data. Recall that

```
## Warning: package 'faraway' was built under R version 3.3.3
```

```
head(uswages, n=4)
```

```
##          wage educ exper race smsa ne mw so we pt
## 6085   771.60   18    18    0    1  1  0  0  0  0
## 23701  617.28   15    20    0    1  0  0  0  1  0
## 16208  957.83   16     9    0    1  0  0  1  0  0
## 2720   617.28   12    24    0    1  1  0  0  0  0
```

We want to fit a linear model using wage as response, educ and exper as predictors.

1. Which of the following code succesfully construct the matrix $\mathbb{X}$.

A. X <- matrix(uswages$educ, uswages$exper)

B. X <- matrix(rep(1,nrow(uswages)), uswages$educ, uswages$exper)

C. X <- cbind(rep(1,nrow(uswages)), uswages$educ, uswages$exper)

D. X <- cbind(uswages$educ, uswages$exper)

2. If we want to fit the model using R function lm(), which of the following call is correct?

A. lm(wage ~ ., data = uswages)

B. lm(y ~ x, data = uswages)

C. lm(wage = educ + exper, data = uswages)

D. lm(wage ~ educ + exper, data = uswages)

3. Explain briefly how you would check whether your proposed solution in (D.2) is correct in R.