Homework 2

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09/16/2019

1

```
#1
A <- matrix(c(2,3,5,4,1,5,7,8), ncol=2, nrow=4)
B <- matrix(c(6,9,3,1), ncol=1, nrow=4)
C <- matrix(c(3,8,5,2,8,6,1,4), ncol=2, nrow=4)
```

A, B, and C Matricies

```
A
```

```
##      [,1] [,2]
## [1,]    2    1
## [2,]    3    5
## [3,]    5    7
## [4,]    4    8
```

```
B
```

```
##      [,1]
## [1,]    6
## [2,]    9
## [3,]    3
## [4,]    1
```

```
C
```

```
##      [,1] [,2]
## [1,]    3    8
## [2,]    8    6
## [3,]    5    1
## [4,]    2    4
```

a. A + C

```
a.1 <- A + C
a.1
```

```
##      [,1] [,2]
## [1,]    5    9
## [2,]   11   11
## [3,]   10    8
## [4,]    6   12
```

b. A - C

```
b.1 <- A - C
b.1
```

```
##      [,1] [,2]
## [1,]   -1   -7
## [2,]   -5   -1
## [3,]    0    6
## [4,]    2    4
```

c. B' * A

```
c.1 <- t(B) %*% A
c.1
```

```
##      [,1] [,2]
## [1,]   58   80
```

d. A * C

```
d.1 <- A %*% t(C)
d.1
```

```
##      [,1] [,2] [,3] [,4]
## [1,]   14   22   11    8
## [2,]   49   54   20   26
## [3,]   71   82   32   38
## [4,]   76   80   28   40
```

e. C' * A

```
e.1 <- t(C) %*% A
e.1
```

```
##      [,1] [,2]
## [1,]   63   94
## [2,]   55   77
```

2

```
X <- matrix(c(1,1,1,1,1,1,4,1,2,3,3,4), ncol=2, nrow=6)
Y <- matrix(c(16,5,10,15,13,22), ncol=1, nrow=6)
```

X and Y Matricies

```
X
```

```
##      [,1] [,2]
## [1,]    1    4
## [2,]    1    1
## [3,]    1    2
## [4,]    1    3
## [5,]    1    3
## [6,]    1    4
```

```
Y
```

```
##      [,1]
## [1,]   16
## [2,]    5
## [3,]   10
## [4,]   15
## [5,]   13
## [6,]   22
```

a. Y' * Y"

```
a.2 <- t(Y) %*% Y
a.2
```

```
##      [,1]
## [1,] 1259
```

b. X' * Y"

```
b.2 <- t(X) %*% Y
b.2
```

```
##      [,1]
## [1,]   81
## [2,]  261
```

c. X' * X"

```
c.2 <- t(X) %*% X
c.2
```

```
##      [,1] [,2]
## [1,]    6   17
## [2,]   17   55
```

d. (X'X)^-1"

```
d.2 <- solve(c.2)
d.2
```

```
##            [,1]       [,2]
## [1,]  1.3414634 -0.4146341
## [2,] -0.4146341  0.1463415
```

e. ((X'X)^-1) * X' * Y"

```
e.2 <- d.2 %*% t(X) %*% Y
e.2
```

```
##           [,1]
## [1,] 0.4390244
## [2,] 4.6097561
```

f. Symmetric Matricies are: A, C, and D "

```
isSymmetric(a.2)
```

```
## [1] TRUE
```

```
isSymmetric(b.2)
```

```
## [1] FALSE
```

```
isSymmetric(c.2)
```

```
## [1] TRUE
```

```
isSymmetric(d.2)
```

```
## [1] TRUE
```

```
isSymmetric(e.2)
```

```
## [1] FALSE
```

g. Summary of linear regression model

```
g.2 <- lm(Y ~ (X - 1))
summary(g.2)
```

```
##
## Call:
## lm(formula = Y ~ (X - 1))
##
## Residuals:
##        1        2        3        4        5        6
## -2.87805 -0.04878  0.34146  0.73171 -1.26829  3.12195
##
## Coefficients:
##    Estimate Std. Error t value Pr(>|t|)
## X1   0.4390     2.6087   0.168  0.87452
## X2   4.6098     0.8616   5.350  0.00589 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.252 on 4 degrees of freedom
## Multiple R-squared:  0.9839, Adjusted R-squared:  0.9758
## F-statistic: 122.1 on 2 and 4 DF,  p-value: 0.0002598
```