CHAPTER 3

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EXAMPLE 1

```
A <- matrix(c(3,8,4,8,7,-1,4,-1,2),3)
B <- matrix(c(1,-1,3,-1,2,4,3,4,6),3)
A+B
```

```
##      [,1] [,2] [,3]
## [1,]    4    7    7
## [2,]    7    9    3
## [3,]    7    3    8
```

EXAMPLE 2

A=(n*n), B=(n*n), x=(n*1), y=(n*1)

(a) y=Ax

(n*1)=(n*n)* (n*1)=(n*1)

(b)xy = A'B => (x)

(n*1)* (n*1)= (n*n) (n*n)

(c)x'Bx

(1*n) *(n*n)* (n*1) = (1*1)

(d)yBx => (x)

(n*1) *(n*n)* (n*1)

(e)y'B'Ax

(1*n) *(n*n)* (n*n)* (n*1) = (1*1)

(f)x'=y'B'

(1*n)= (1*n) *(n*n)=(1*n)

(g)x'Ay

(1*n)* (n*n)* (n*1) = (1*1)

(h)y'A'By

(1*n)* (n*n)* (n*n)* (n*1)

(i)xy'=B'

(n*1)* (1*n)= (n*n)

(j)$y + \begin{matrix}30\\40\end{matrix}$ = AB'x, n=2 인 경우

(2*1)+(2*1)=(2*2)* (2*2)* (2*1)

(2*1) = (2*1)

EXAMPLE 3

```
A <- matrix(c(1,2,1,1),2)
B <- matrix(c(3,4,6,8),2)
x <- matrix(c(1,2),2)
y <- matrix(c(3,4),2)

# (a) y = Ax
y
```

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

```
A%*%x
```

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

```
# (b) xy = A'B (X)
x*y
```

```
##      [,1]
## [1,]    3
## [2,]    8
```

```
t(A) %*% B
```

```
##      [,1] [,2]
## [1,]   11   22
## [2,]    7   14
```

```
# (c) x'Bx
t(x) %*% B %*% x
```

```
##      [,1]
## [1,]   55
```

```
# (d) yBx (X)
# y %*% B %*% x
```

```
# (e) y'B'Ax
t(y) %*% t(B) %*% x
```

```
##      [,1]
## [1,]  121
```

```
# (f) x'=y'B' (X)
t(x)
```

```
##      [,1] [,2]
## [1,]    1    2
```

```
t(y) %*% t(B)
```

```
##      [,1] [,2]
## [1,]   33   44
```

```
# (g) x'Ay
t(x)%*% A%*% y
```

```
##      [,1]
## [1,]   27
```

```
# (h) y'A'By
t(y) %*% t(A) %*% B %*% y
```

```
##      [,1]
## [1,]  671
```

```
# (i) xy' = B'
x %*% t(y)
```

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

```r
t(B)
```

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

```r
# (J) y + matirx(c(30,40),2) = AB'x
y + matrix(c(30,40),2)
```

```
##      [,1]
## [1,]   33
## [2,]   44
```

```r
A %*% t(B) %*% x
```

```
##      [,1]
## [1,]   33
## [2,]   44
```

EXAMPLE 5 x'x = x 라면 x = x' = x^2 이 됨을 보여라.

(열의 내적을 이용하여) A'A=0 인 성질을 이용하여 A = X-X^2
A'A = (X-X^2)'*(X-X^2)
= X'X - X'X^2 - X'^2 - X'^2X^2
= X- XX - X'X + X^2
= X- X^2 - X + X^2 = 0

EXAMPLE 6

(a) 대칭인 실수 행렬 A 에 대하여 A^2 = 0 이면 A =0 임을 증명하라.
A = A^t
A^2 = (t(A))^2 = t(A^2)=0
A^2 = At(A) = t(A)A = 0
t(A) = 0
A = 0

(b) X'XGX'X = X'X 이면 XGX'X=X 임을 설명하라.
XGX'X-X=0
(XGX'X-X)(XGX'X-X)'=0
XX'GG'X'XXX'-XGX'XX'-X'G'XX'X+XX'=0
X'G'XX'(XGX'X-X)-X'(XGX'X-X)=0
*(P29 3- 실수행렬 P,Q,X 에 대하여 곱셈이 가능하다면
(XGX'X-X)(X'G'XX'-X')
=(XGX'X-X)(XGX'X-X)'