

# HomeWork1Problem2

Ronaldlee Ejalu

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## definning the different matrices and vectors

### of problem2

```
Z = matrix(c(1, -1, 1, 2, 1, -2, 1, 0), nrow = 4, ncol = 2, byrow = T)
Z
```

```
##      [,1] [,2]
## [1,]    1  -1
## [2,]    1   2
## [3,]    1  -2
## [4,]    1   0
```

```
Y = matrix(c(0, 5, 0, 8), nrow = 4, ncol = 1)
Y
```

```
##      [,1]
## [1,]    0
## [2,]    5
## [3,]    0
## [4,]    8
```

```
M = matrix(c(11, 5, 0, 25, 20, 5, 0, 15, 11), nrow = 3, ncol = 3, byrow = T)
M
```

```
##      [,1] [,2] [,3]
## [1,]   11    5    0
## [2,]   25   20    5
## [3,]    0   15   11
```

```
N = matrix(c(-11, -5, 0, 0, 11, 5, 11, 11, -11), nrow = 3, ncol = 3, byrow =
T)
N
```

```
##      [,1] [,2] [,3]
## [1,]  -11  -5    0
## [2,]    0   11    5
## [3,]   11   11  -11
```

```
v = matrix(c(-6, 0, 8), nrow = 3, ncol = 1)
v
```

```
##      [,1]
## [1,]  -6
## [2,]   0
## [3,]   8

w = matrix(c(3, 1, 0), nrow = 3, ncol = 1)
w
##      [,1]
## [1,]   3
## [2,]   1
## [3,]   0
```

#(a)v.w (dot product)

```
dotproduct = v * w
dotproduct
##      [,1]
## [1,] -18
## [2,]   0
## [3,]   0
```

#(b)-3\*w

```
b = -3 * w
b
##      [,1]
## [1,]  -9
## [2,]  -3
## [3,]   0
```

#(c)M \* v

```
Mv = M %*% v
Mv
##      [,1]
## [1,] -66
## [2,] -110
## [3,]   88
```

#(d) M + N

```
sum = M + N
sum
##      [,1] [,2] [,3]
## [1,]   0   0   0
## [2,]  25  31  10
## [3,]  11  26   0
```

#(e) M - N

```
diff = M - N
diff
```

```
##      [,1] [,2] [,3]
## [1,]   22  10   0
## [2,]   25   9   0
## [3,]  -11   4  22
```

#(f)  $Z^T Z$

```
result = t(Z) %*% Z
result
```

```
##      [,1] [,2]
## [1,]    4  -1
## [2,]   -1   9
```

#(g) Compute  $\beta = (Z^T Z)^{-1}$

```
beta = solve(t(Z) %*% Z)
beta
```

```
##      [,1] [,2]
## [1,] 0.25714286 0.02857143
## [2,] 0.02857143 0.11428571
```

#(h) transpose of  $Z * Y$

```
result = t(Z) %*% Y
result
```

```
##      [,1]
## [1,]   13
## [2,]   10
```

#(i) Compute  $\beta = (Z^T Z)^{-1} * Z^T * Y$

```
beta2 = solve((t(Z) %*% Z)) %*% t(Z) %*% Y
beta2
```

```
##      [,1]
## [1,] 3.628571
## [2,] 1.514286
```

#(j) compute  $\det(Z^T Z)$

```
determ = det(t(Z) %*% Z)
determ
```

```
## [1] 35
```