

Khyati Naik: Data 605 - HW1

Sep 2, 2023

```
x <- c(
  seq(-2,0,-1.5,length.out=500),
  rep(-2, 500),
  seq(-2,-1.5,length.out=500),

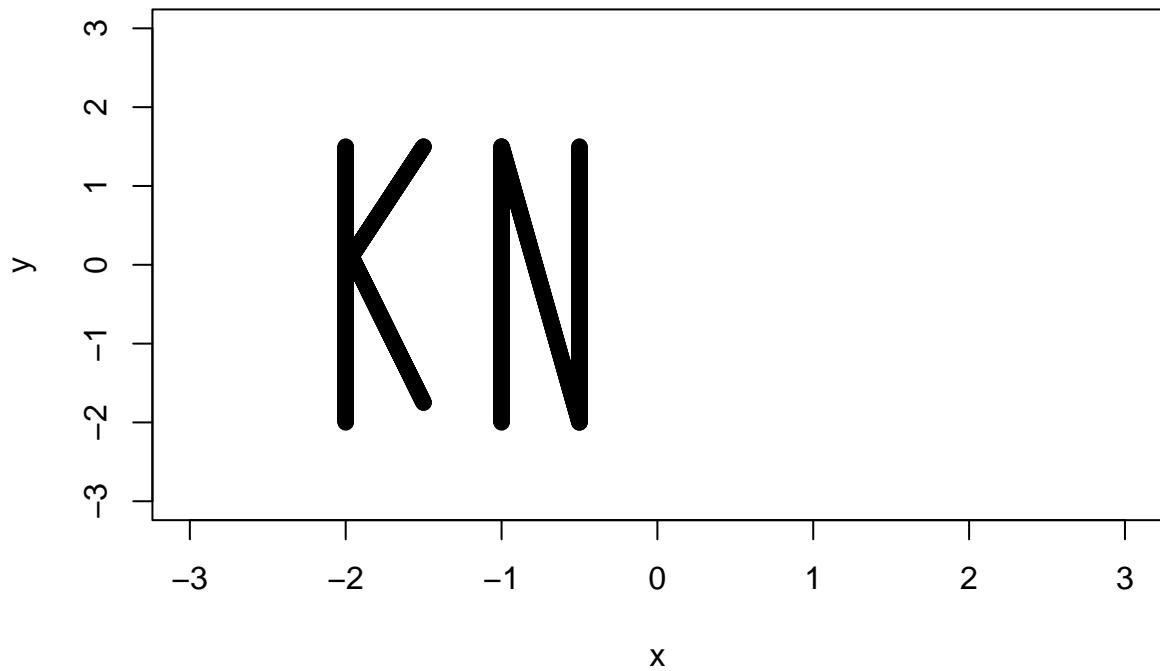
  rep(-1, 500),
  seq(-1,-0.5,length.out=500),
  rep(-0.5, 500)
)

y <- c(
  seq(0,1.5,length.out=500),
  seq(-2,1.5,length.out = 500),
  seq(0.25, -1.75, length.out = 500),

  seq(-2,1.5,length.out = 500),
  seq(1.5,0,-2,length.out=500),
  seq(-2,1.5,length.out = 500)

)

z=rbind(x,y)
plot(y~x, xlim=c(-3,3), ylim=c(-3,3))
```



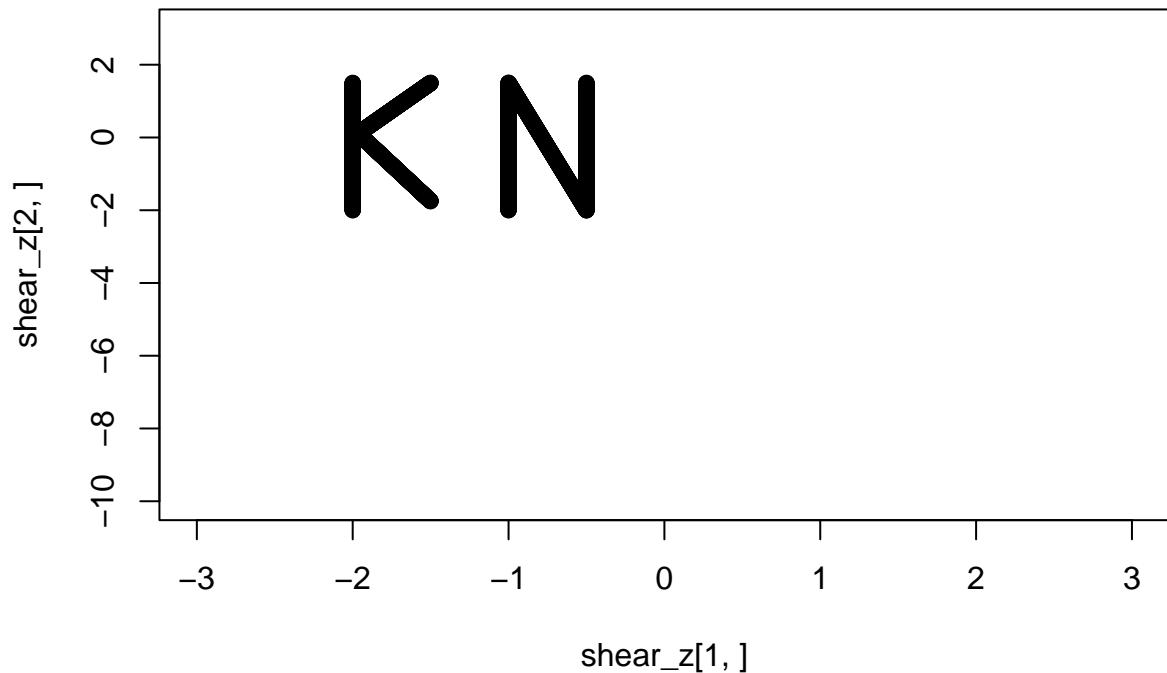
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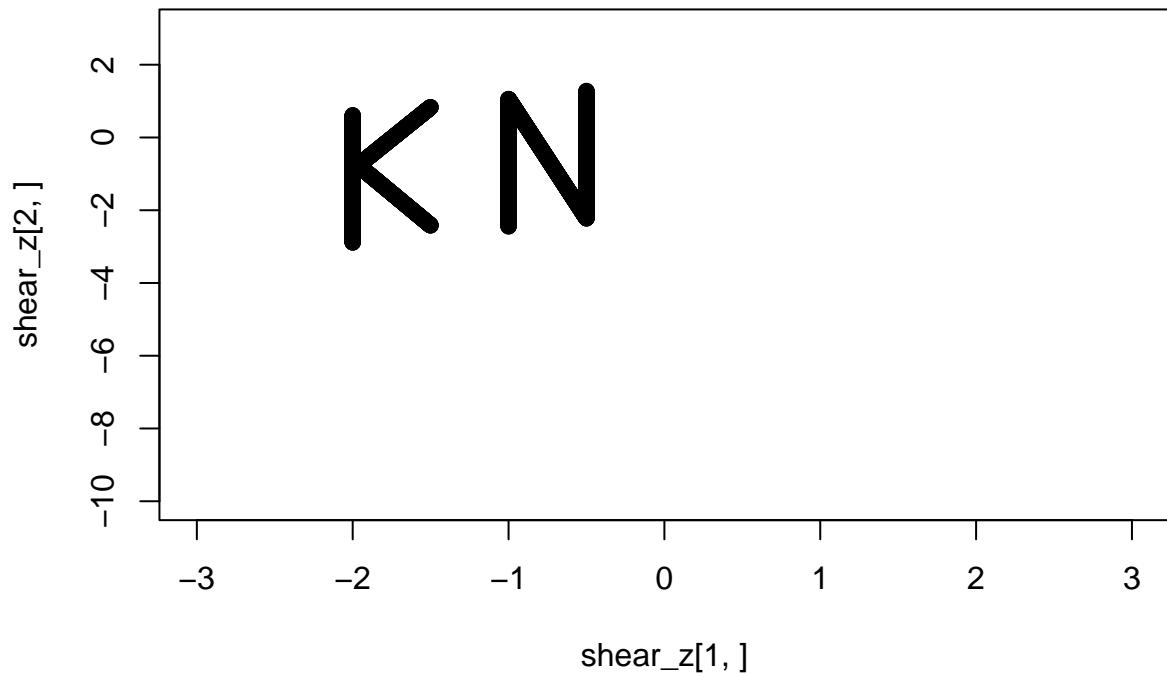
left_multiply <- function(x, y) {
  x %*% y
}
left_multiply(matrix(rep(seq(1, 3, length.out = 3), 3), nrow = 3, ncol = 3), diag(3))

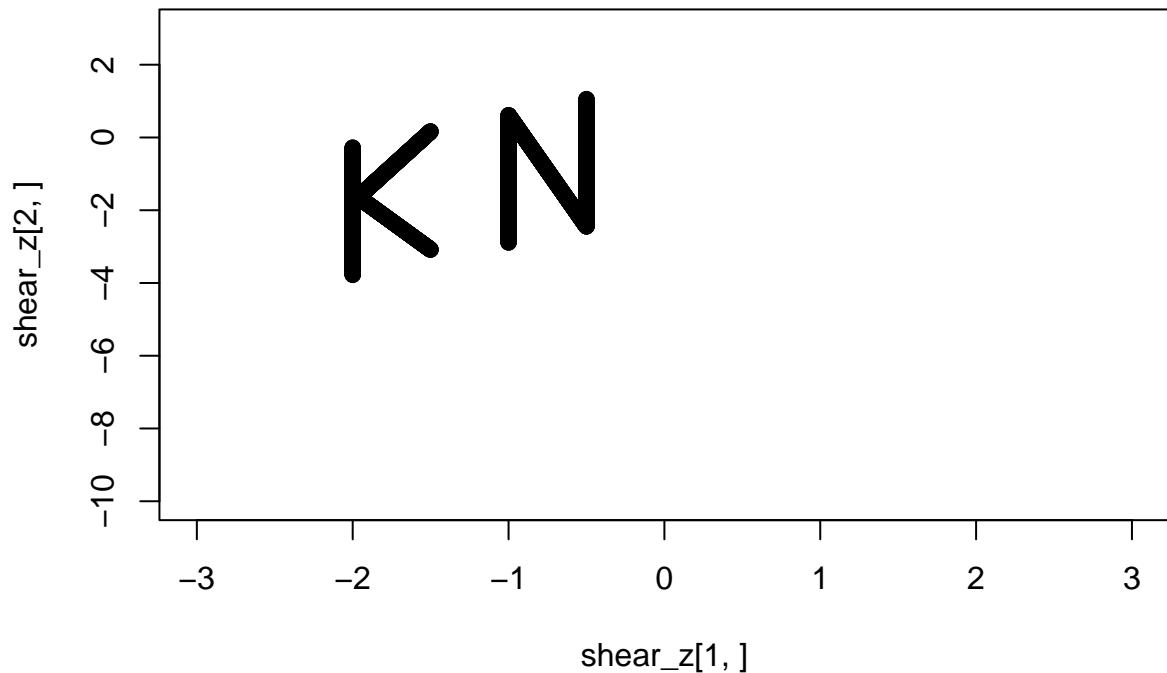
##      [,1] [,2] [,3]
## [1,]     1     1     1
## [2,]     2     2     2
## [3,]     3     3     3

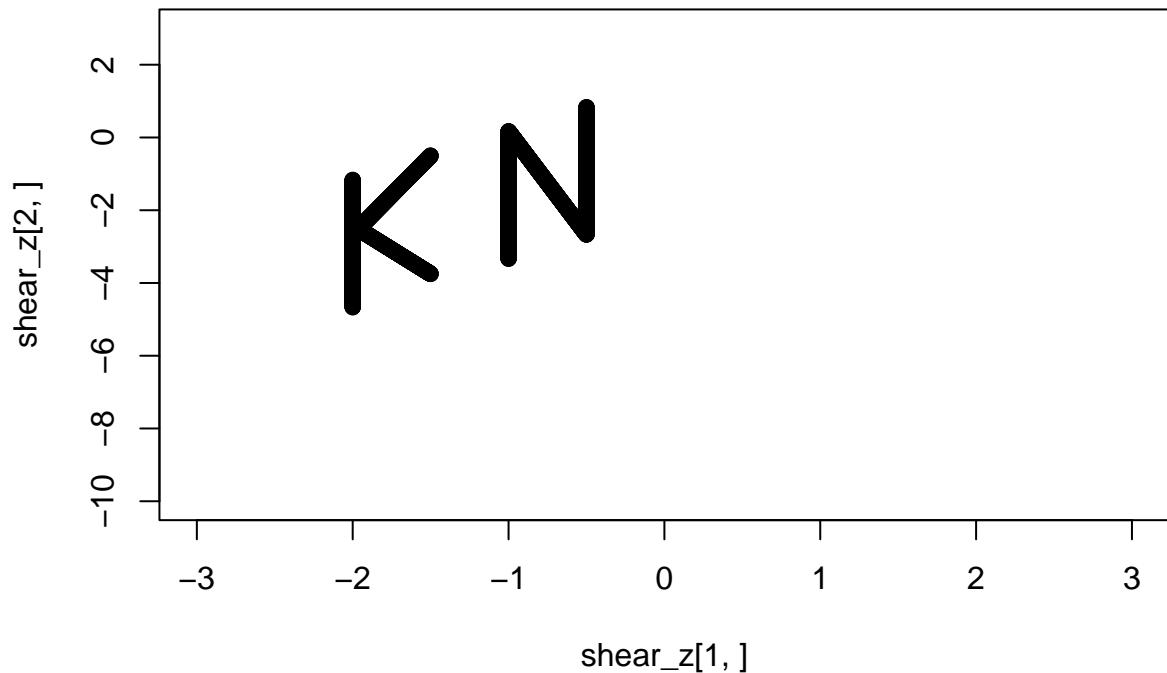
for (i in seq(0, 4, length.out = 10)) {
  shear_z <- apply(z, 2, function(x) left_multiply(x, matrix(c(1, 0, i, 1), nrow = 2, ncol = 2)))
  plot(shear_z[2,] ~ shear_z[1,], xlim = c(-3, 3), ylim = c(-10, 3))
}

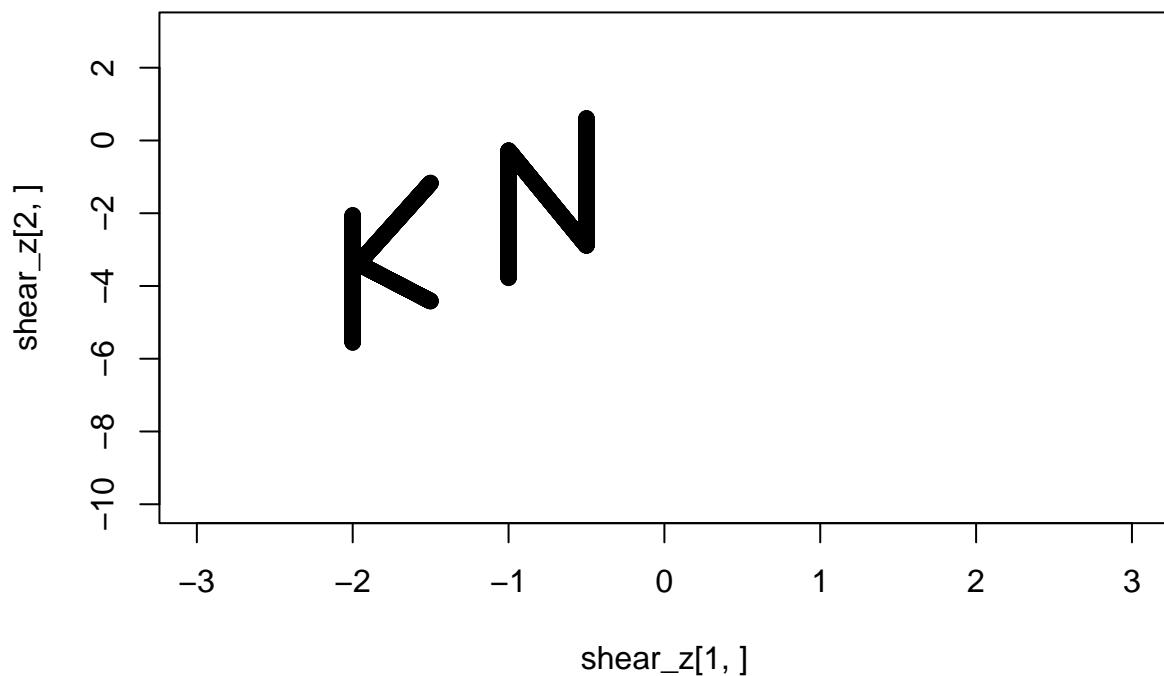
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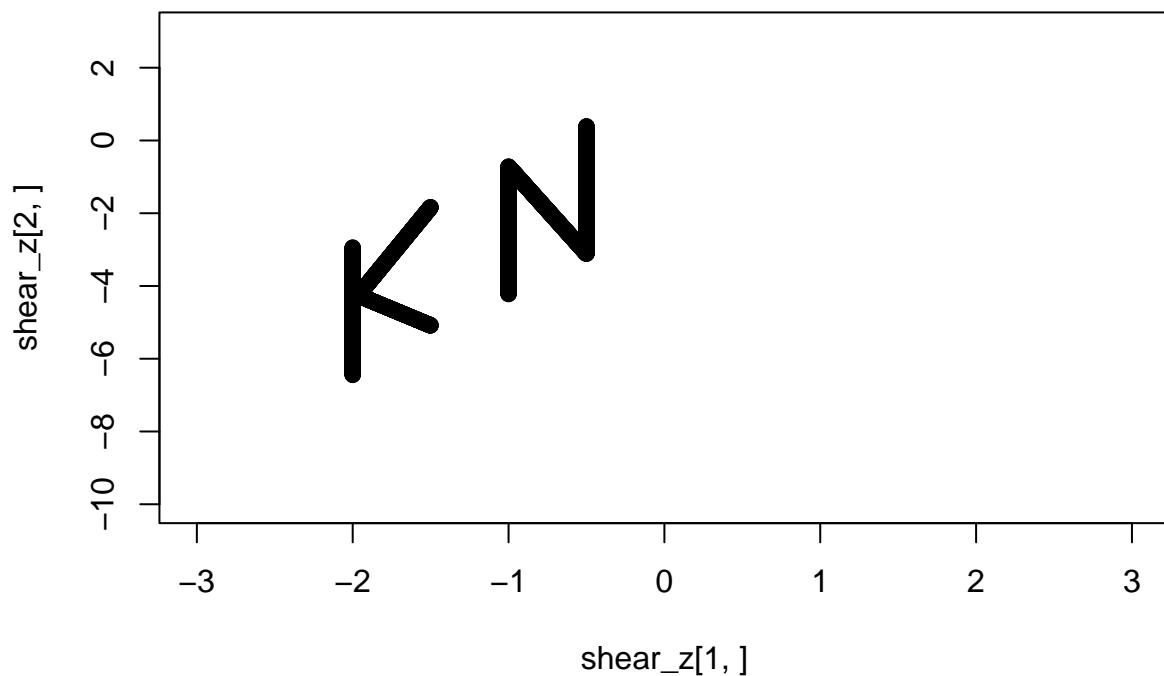


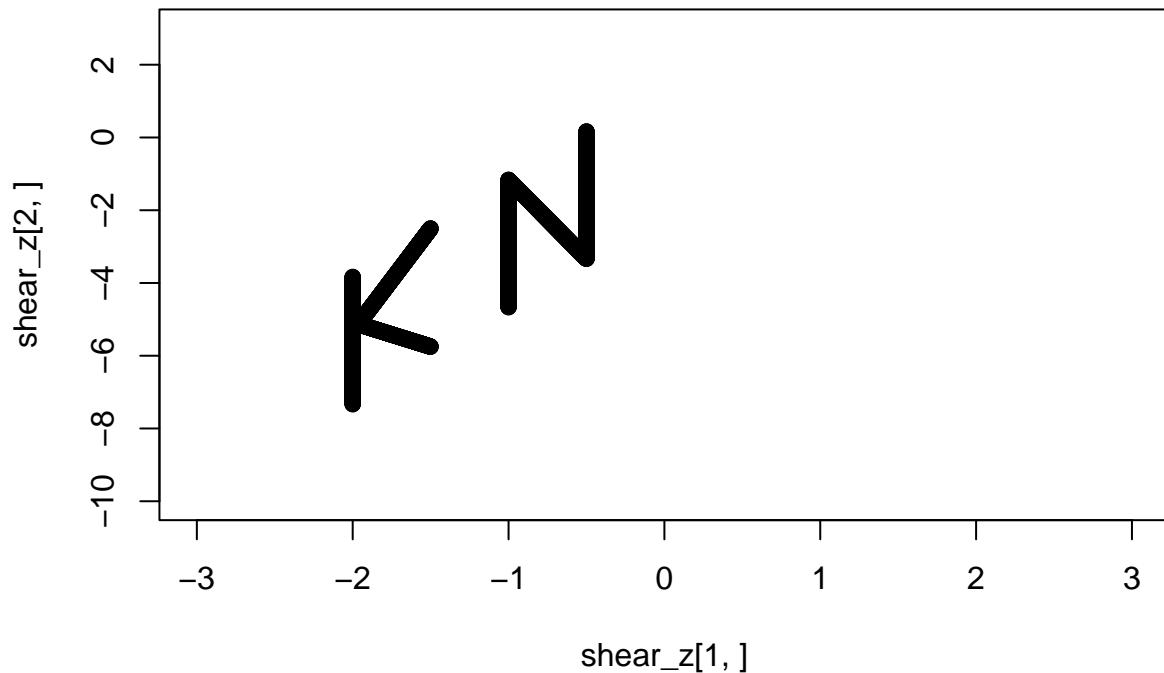


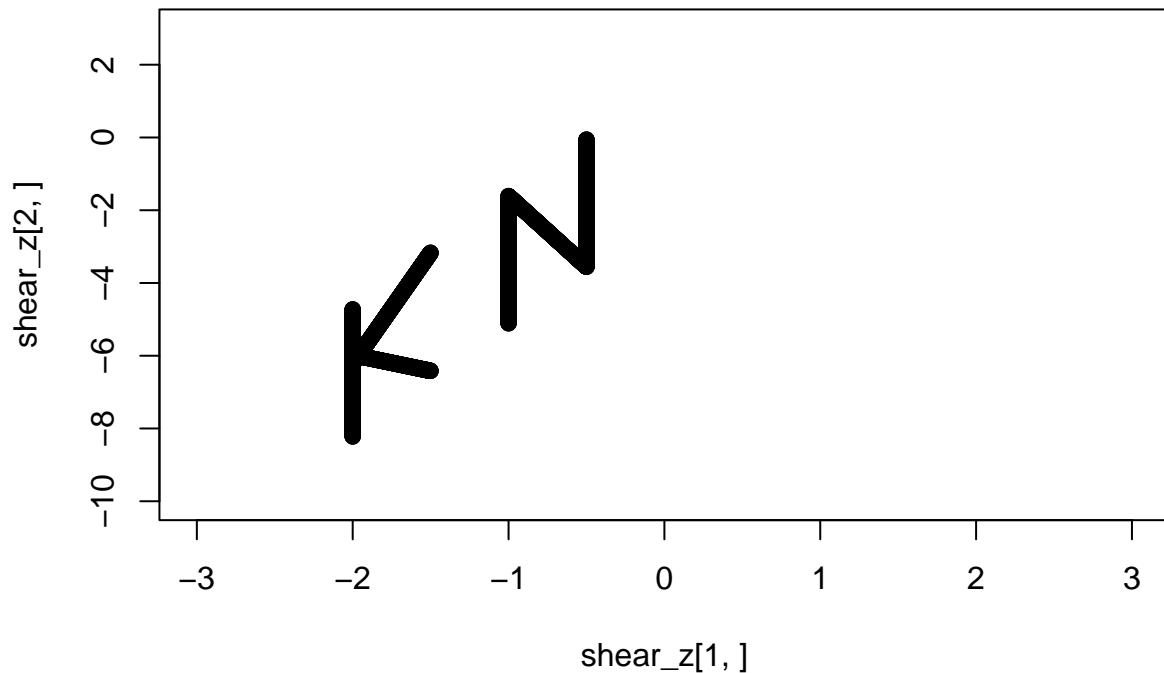


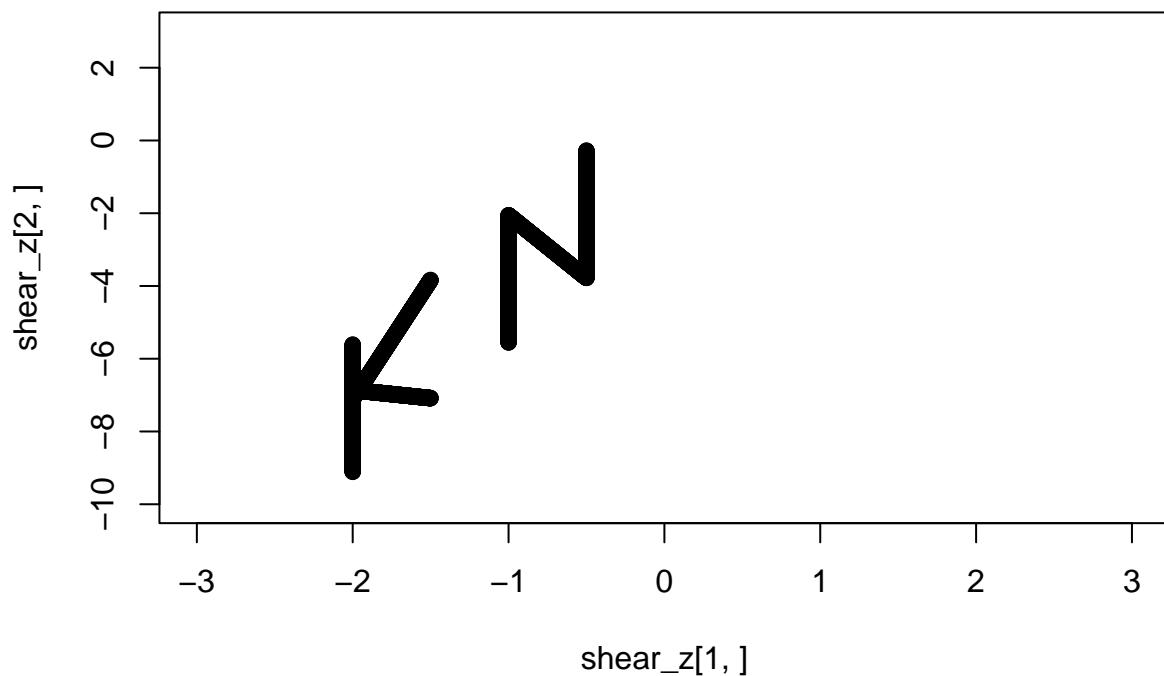


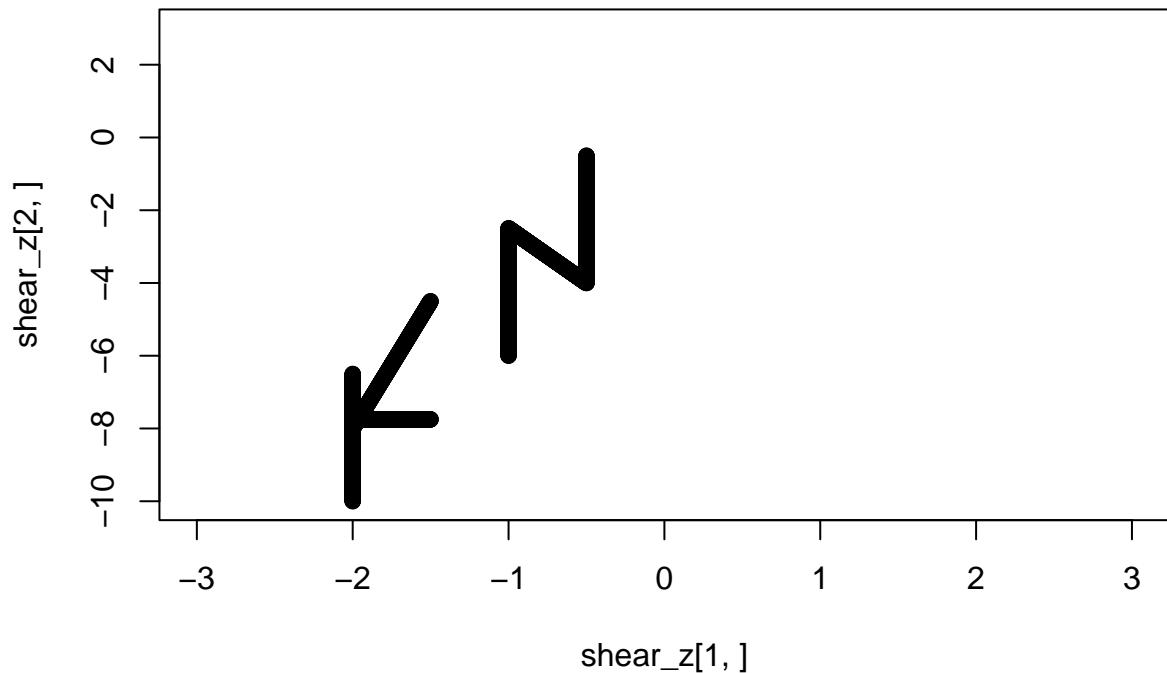




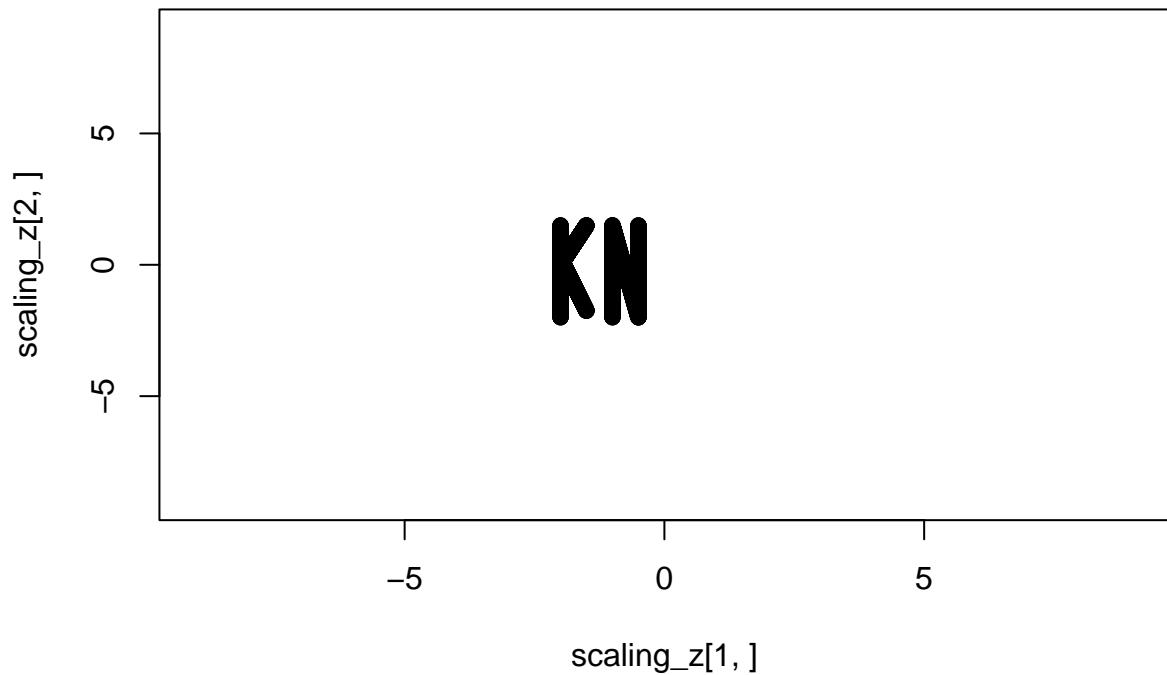


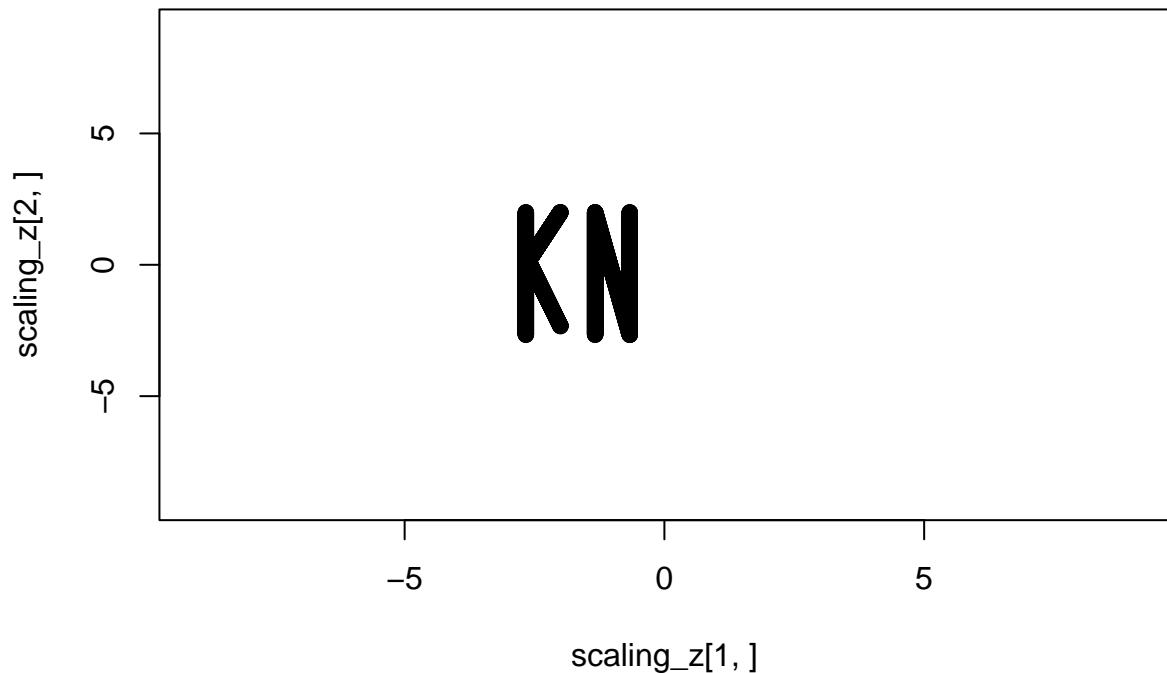


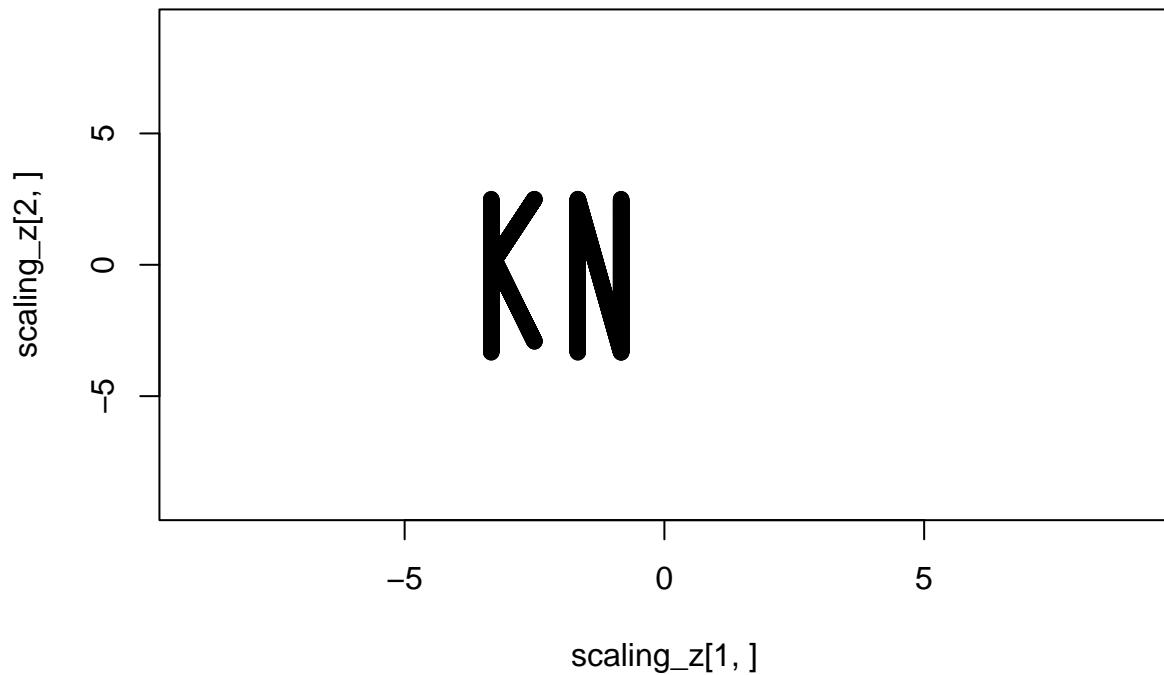


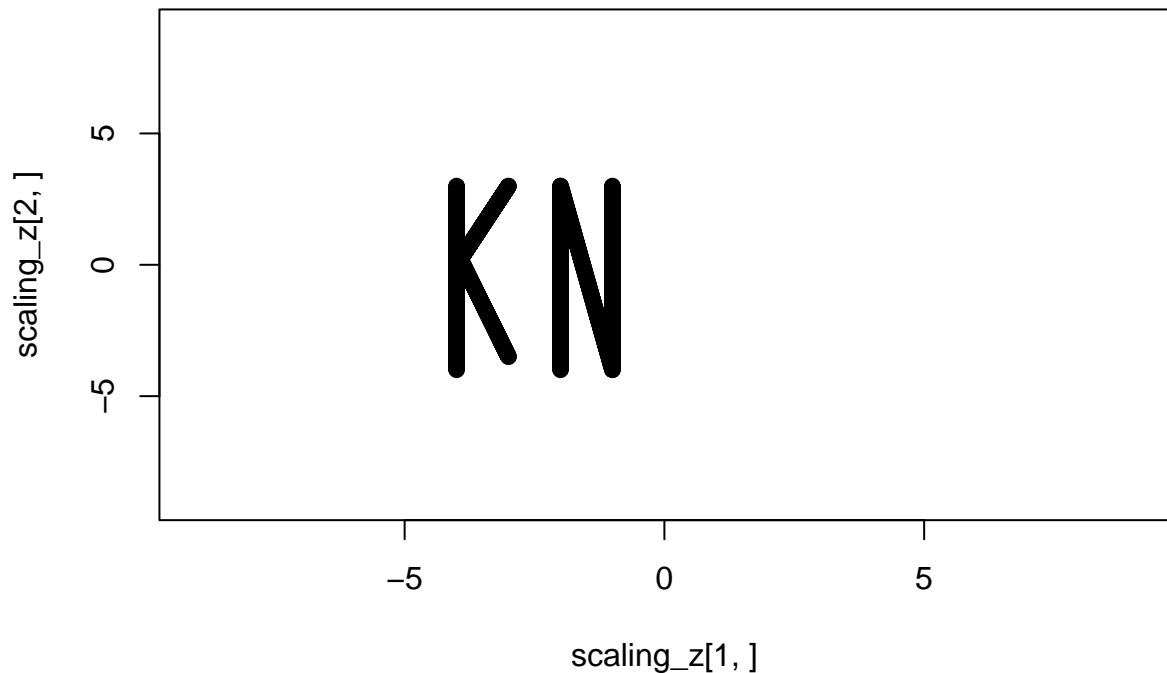


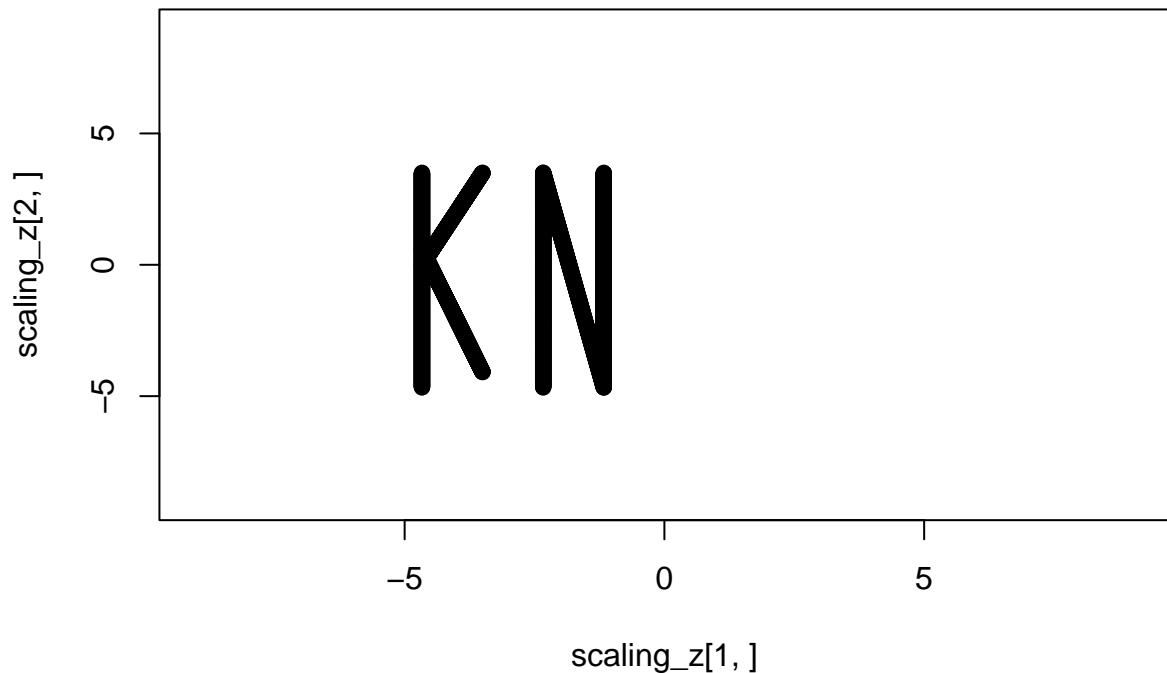
```
for (i in seq(1, 4, length.out = 10)) {  
  scaling_z <- apply(z, 2, function(x) left_multiply(x, matrix(c(i, 0, 0, i), nrow = 2, ncol = 2)))  
  plot(scaling_z[2,] ~ scaling_z[1,], xlim = c(-9, 9), ylim = c(-9, 9))  
}
```

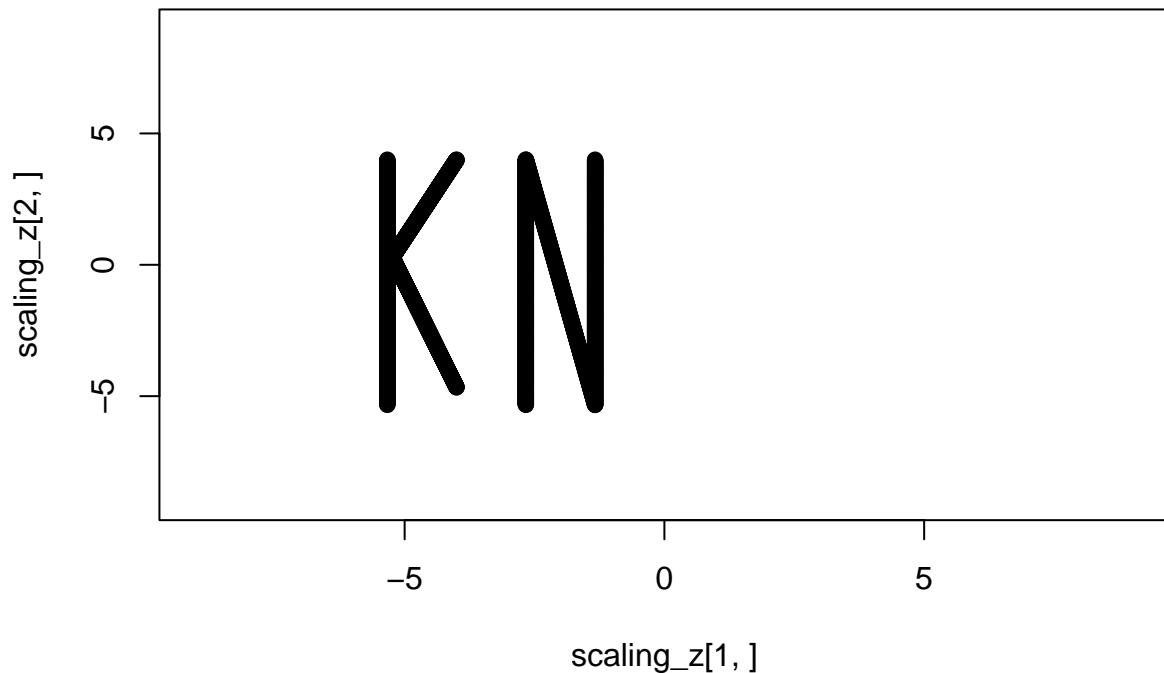


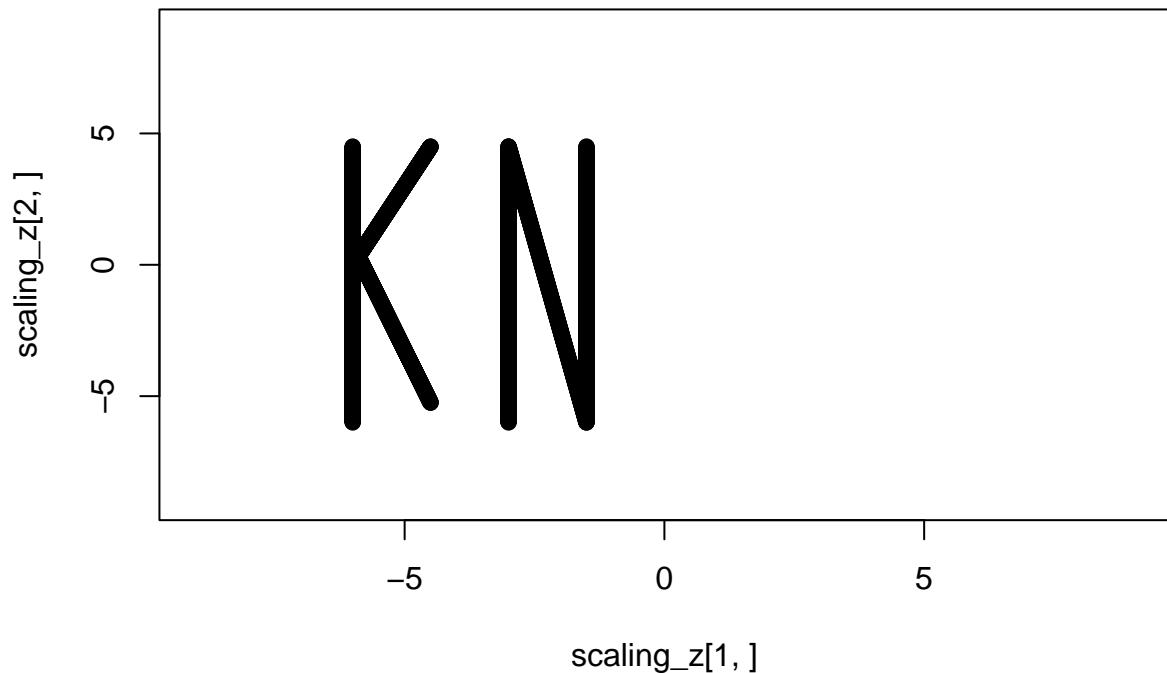


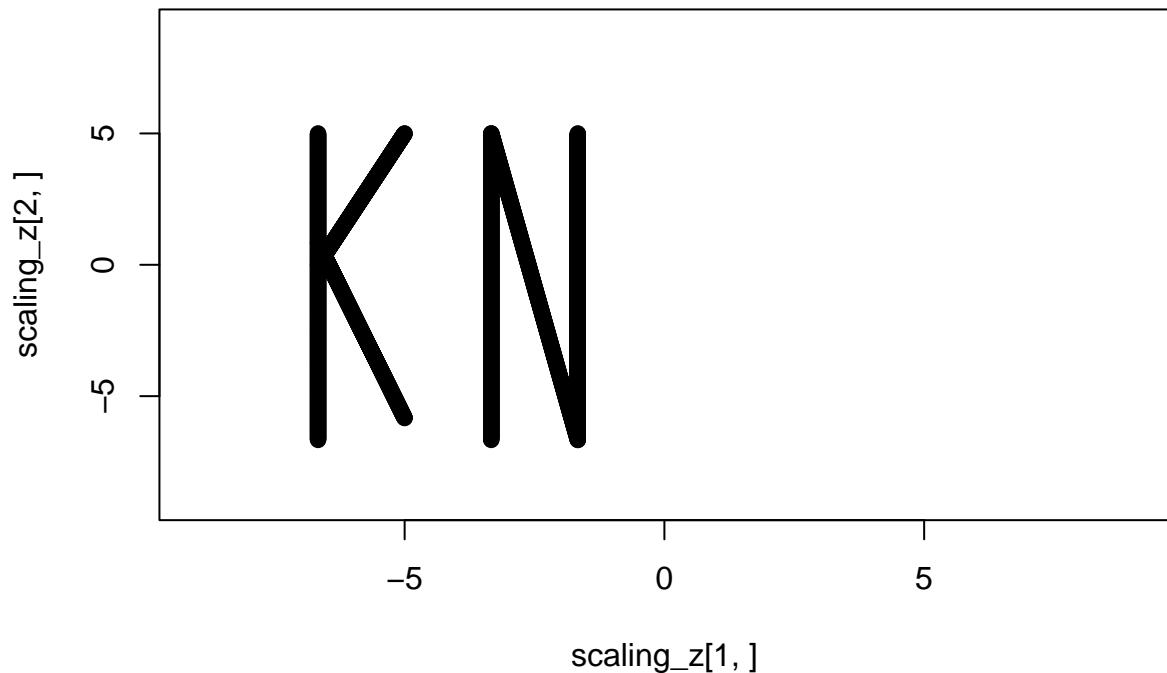


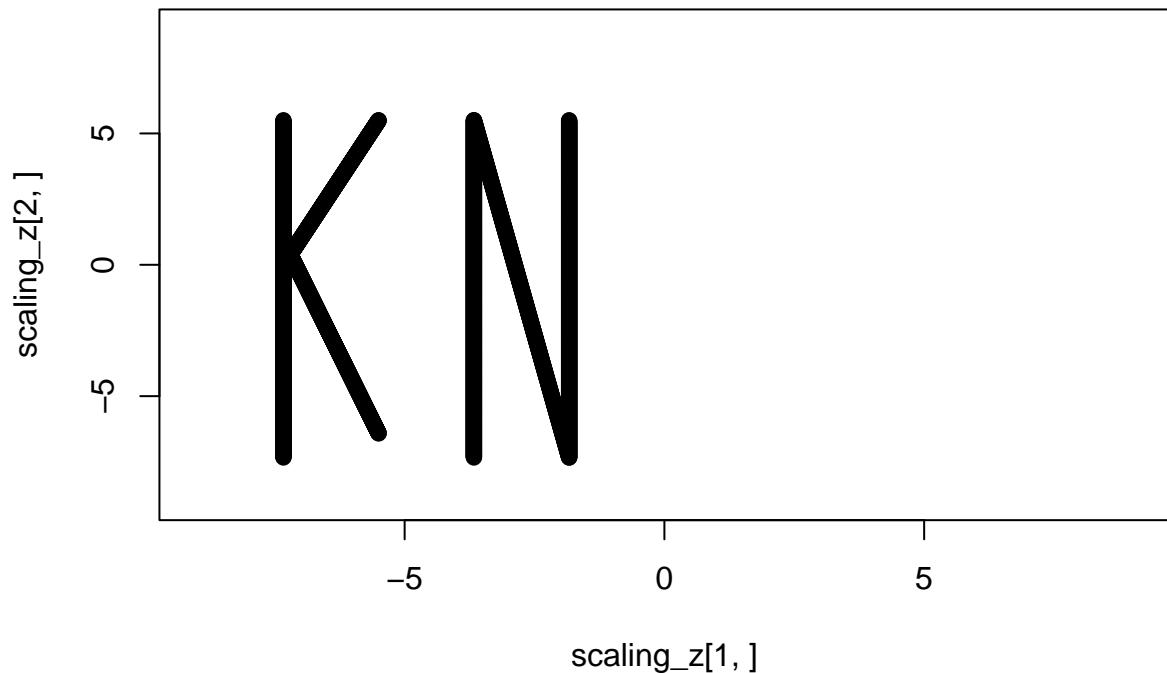


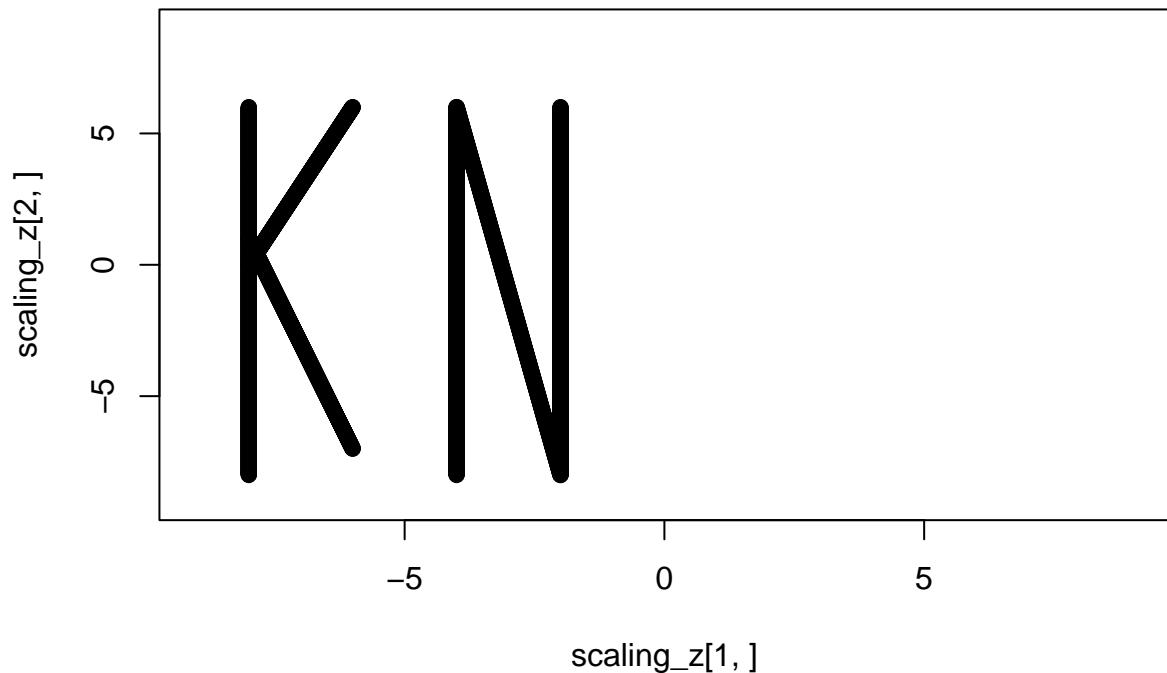








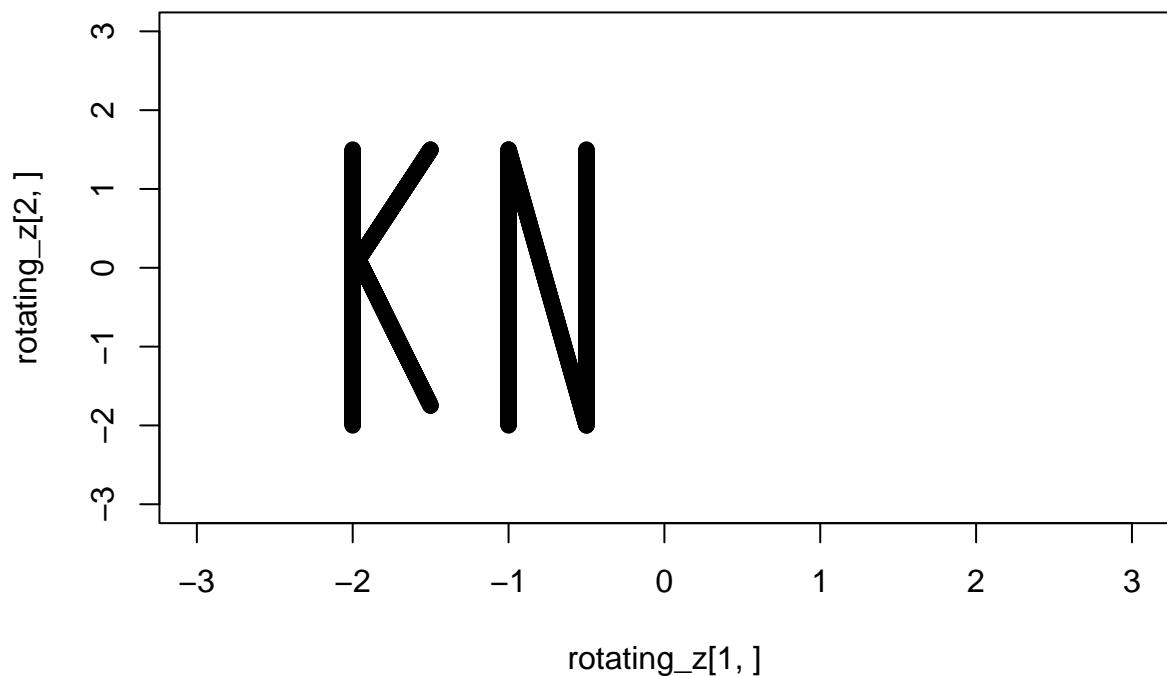


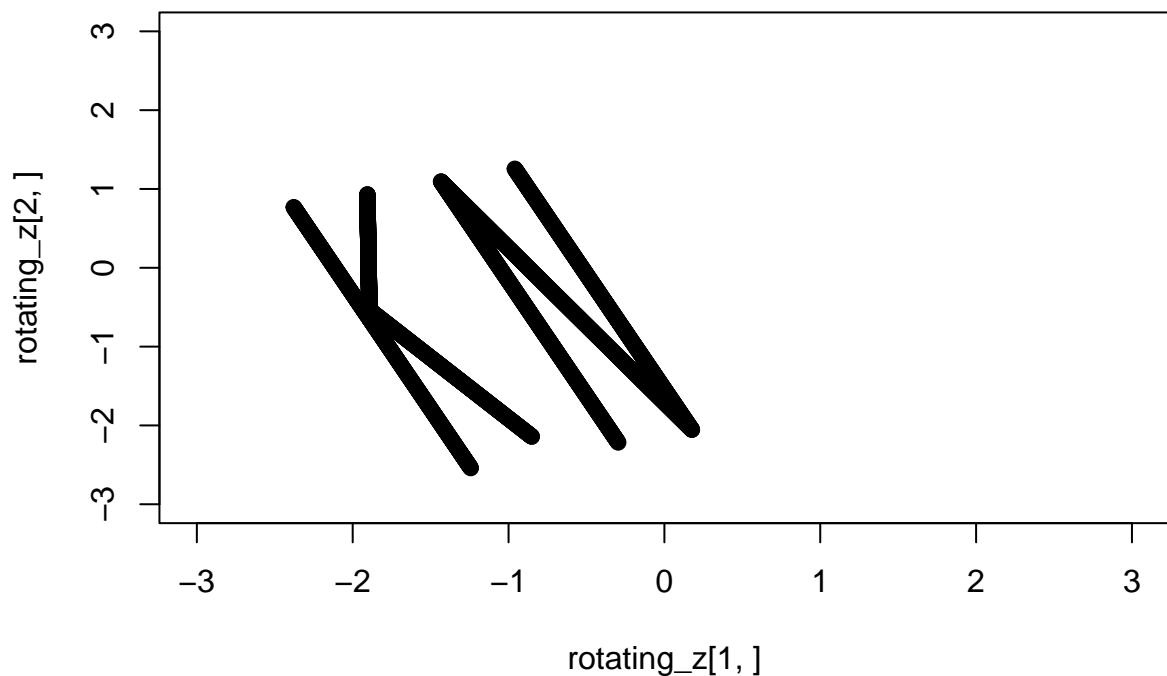


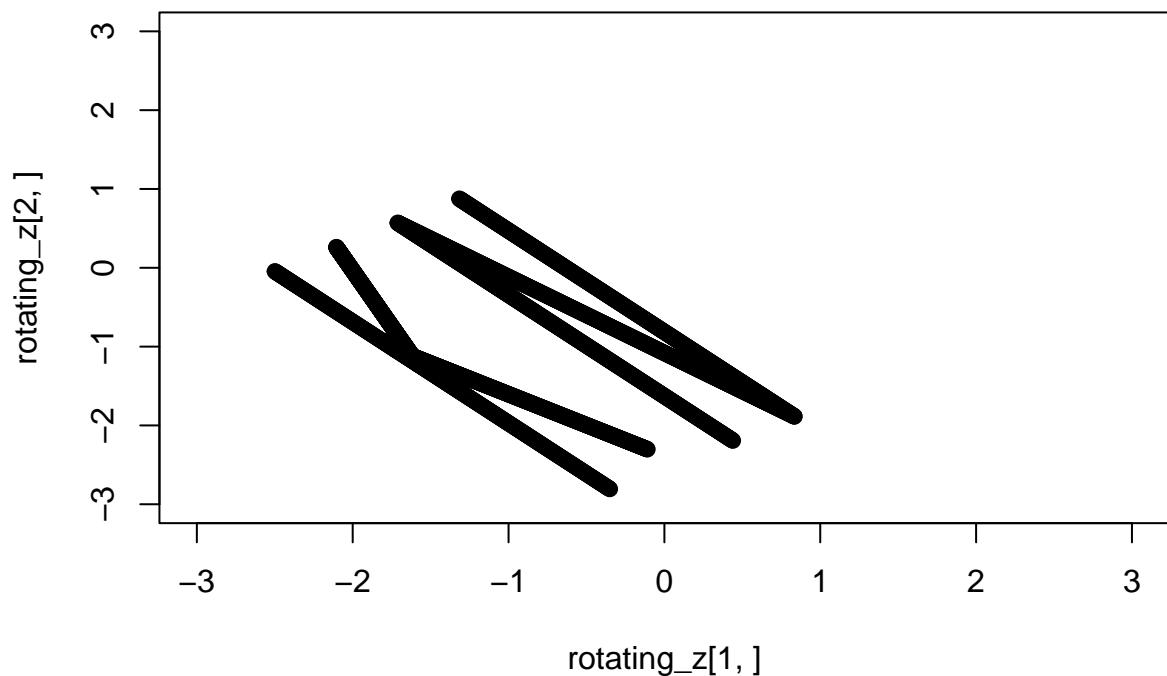
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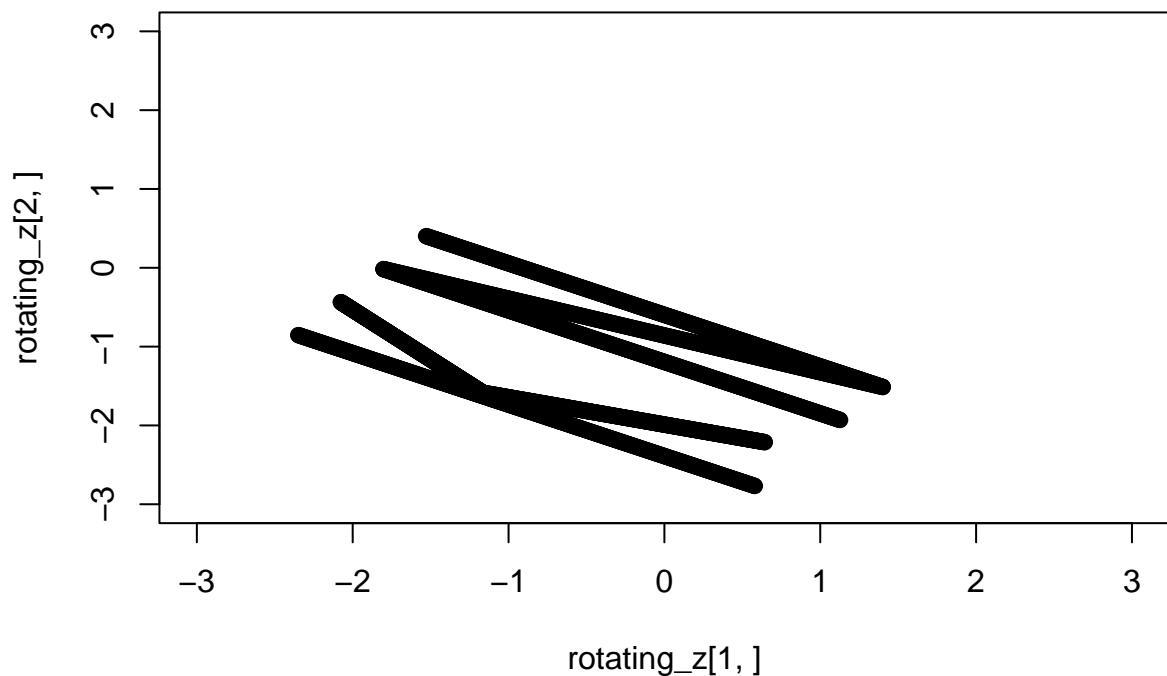
for (i in seq(0, pi * 2, length.out = 20)) {
  rotating_z <- apply(z, 2, function(x) left_multiply(x, matrix(c(cos(i), -sin(i), sin(i), cos(i)), nrow = 2, ncol = 2) %*% x))
  plot(rotating_z[2,] ~ rotating_z[1,], xlim = c(-3, 3), ylim = c(-3, 3))
}

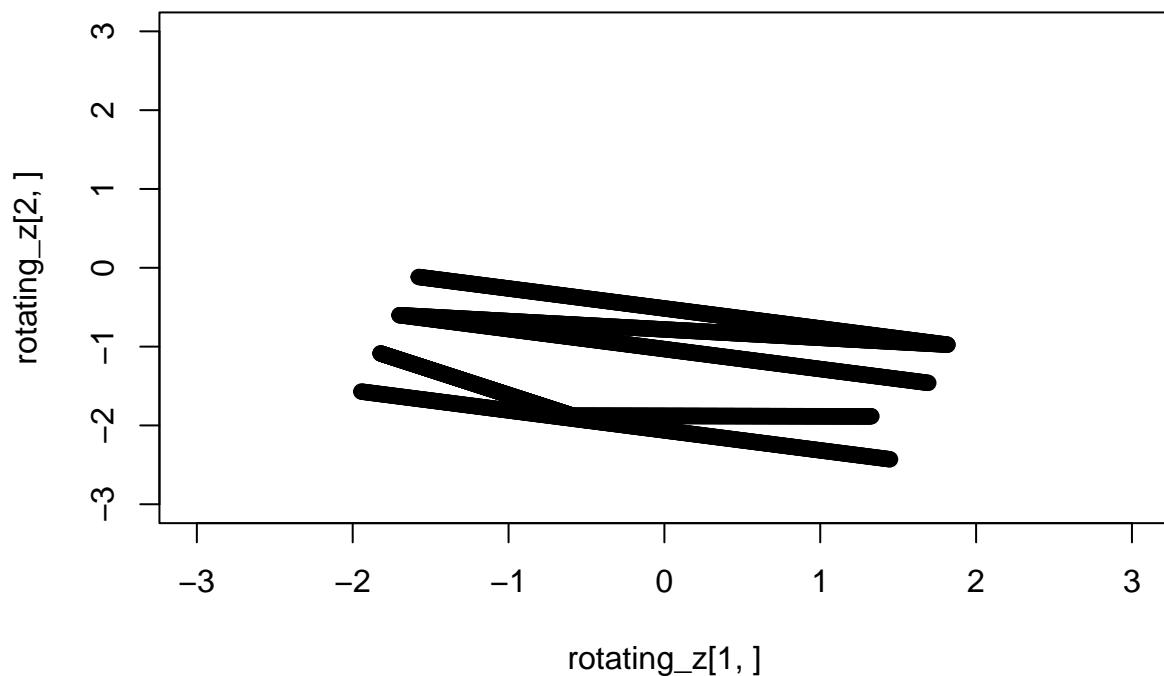
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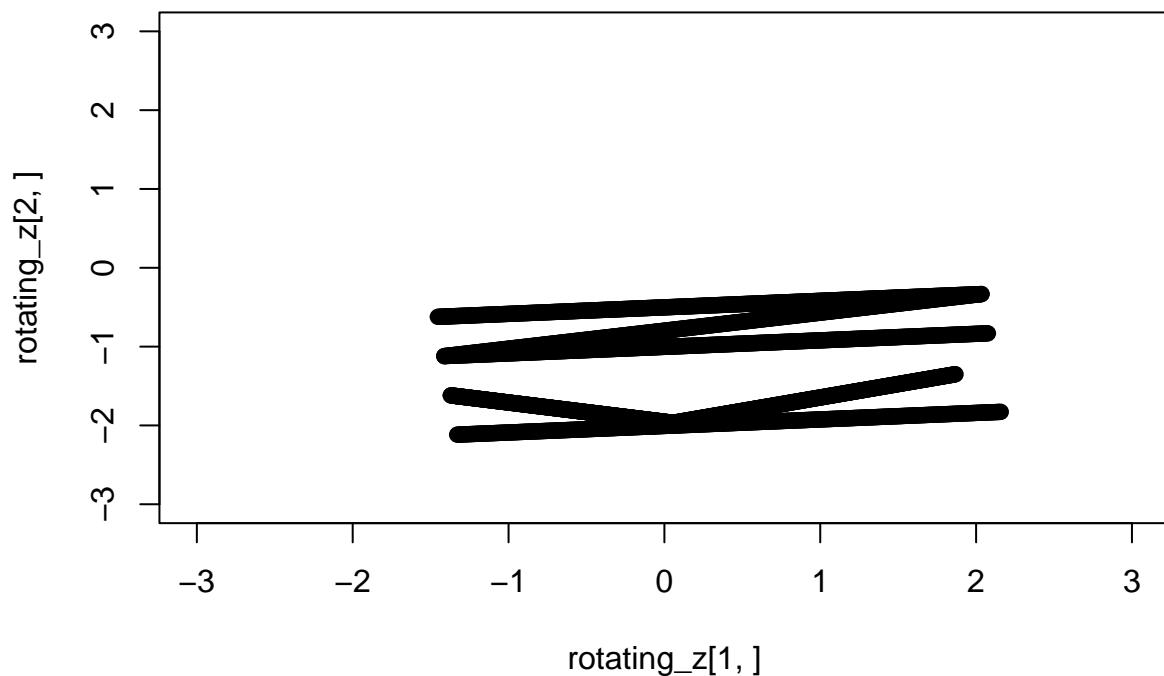


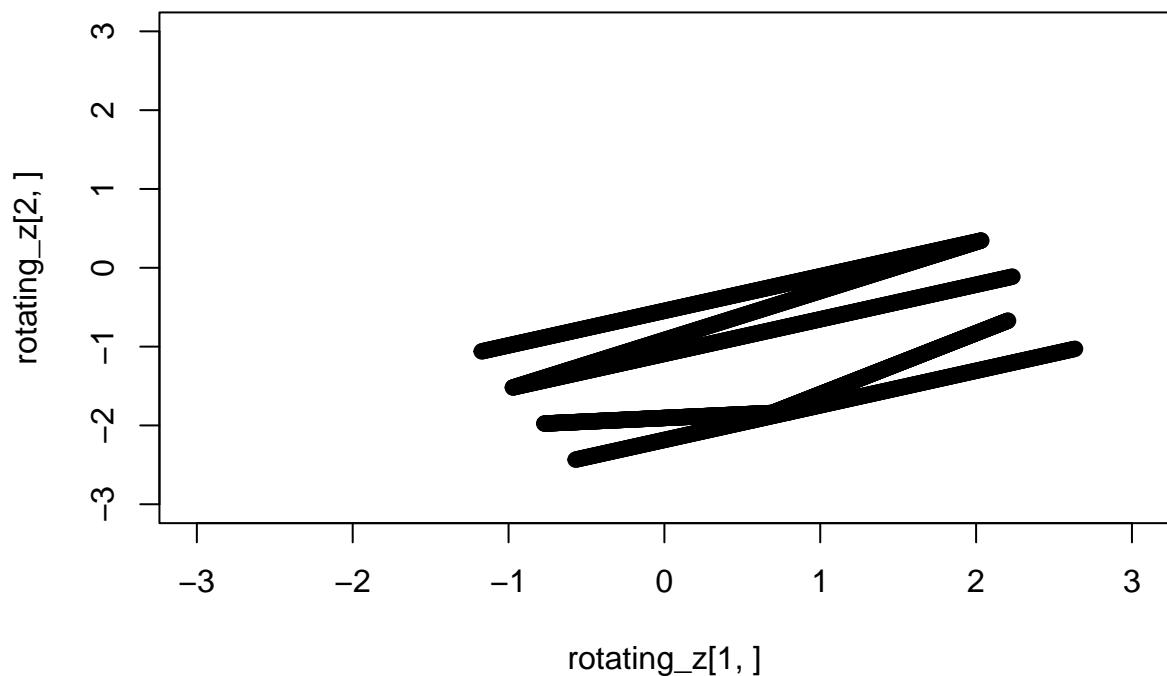


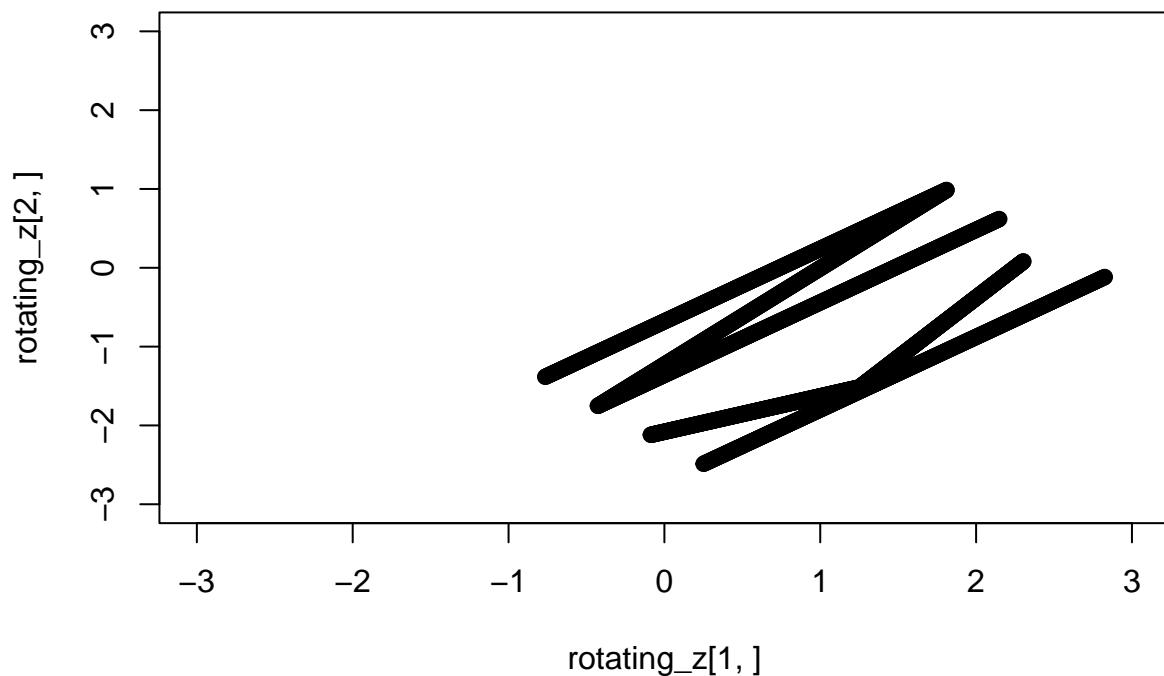


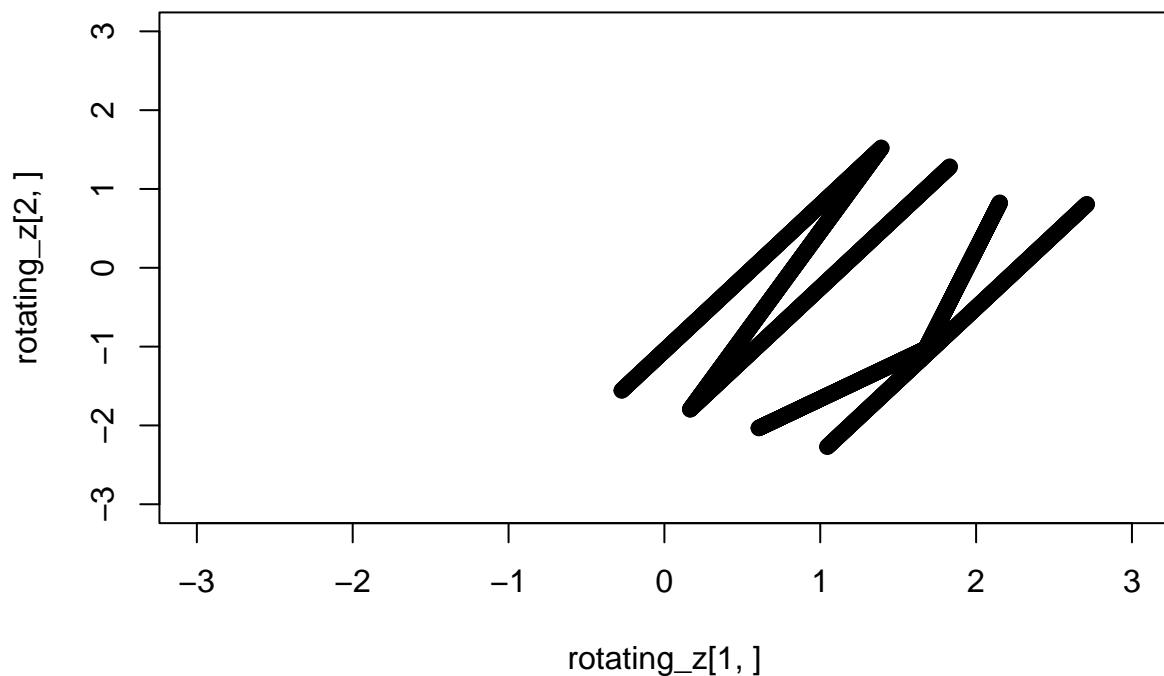


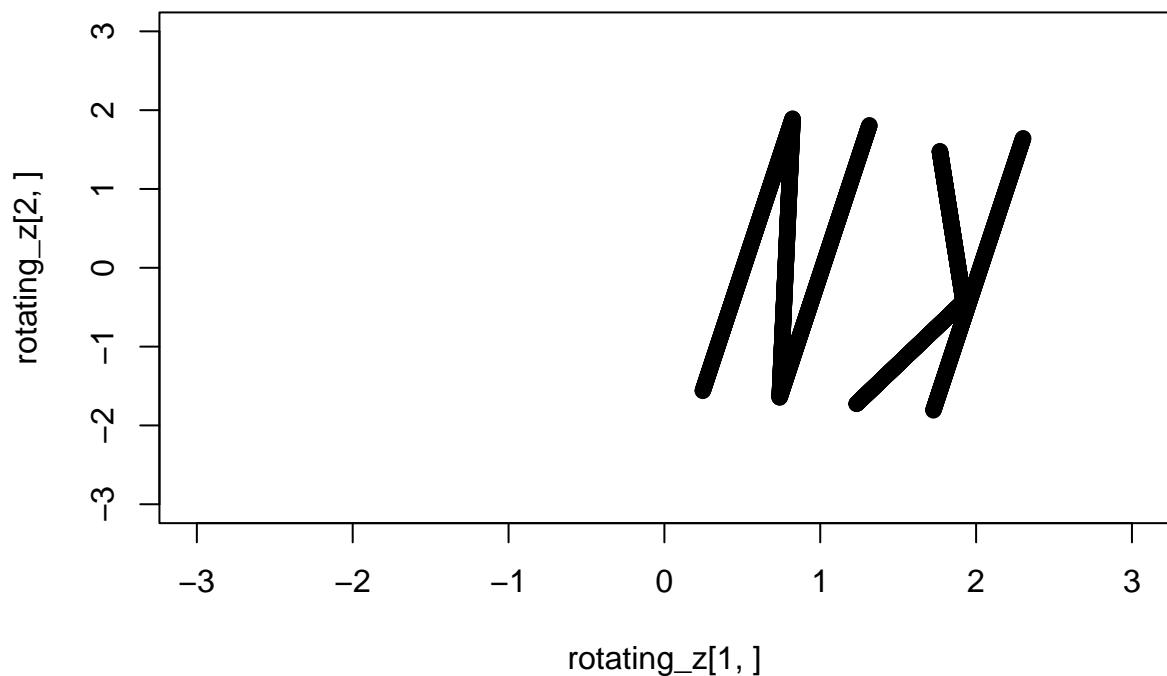


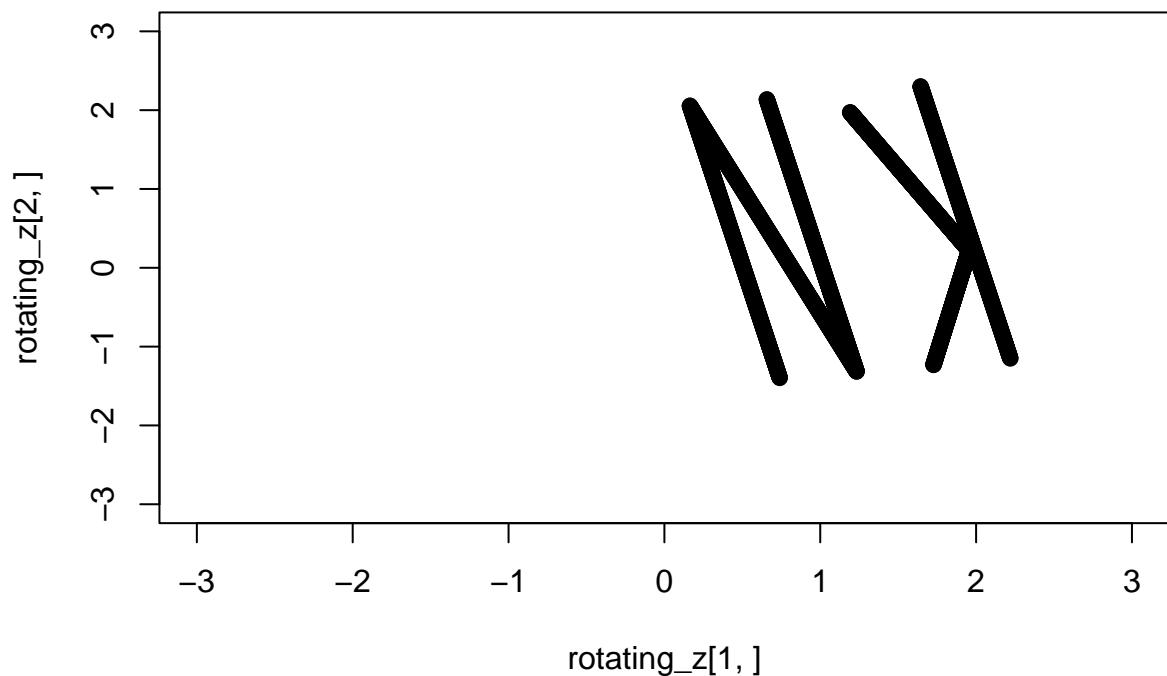


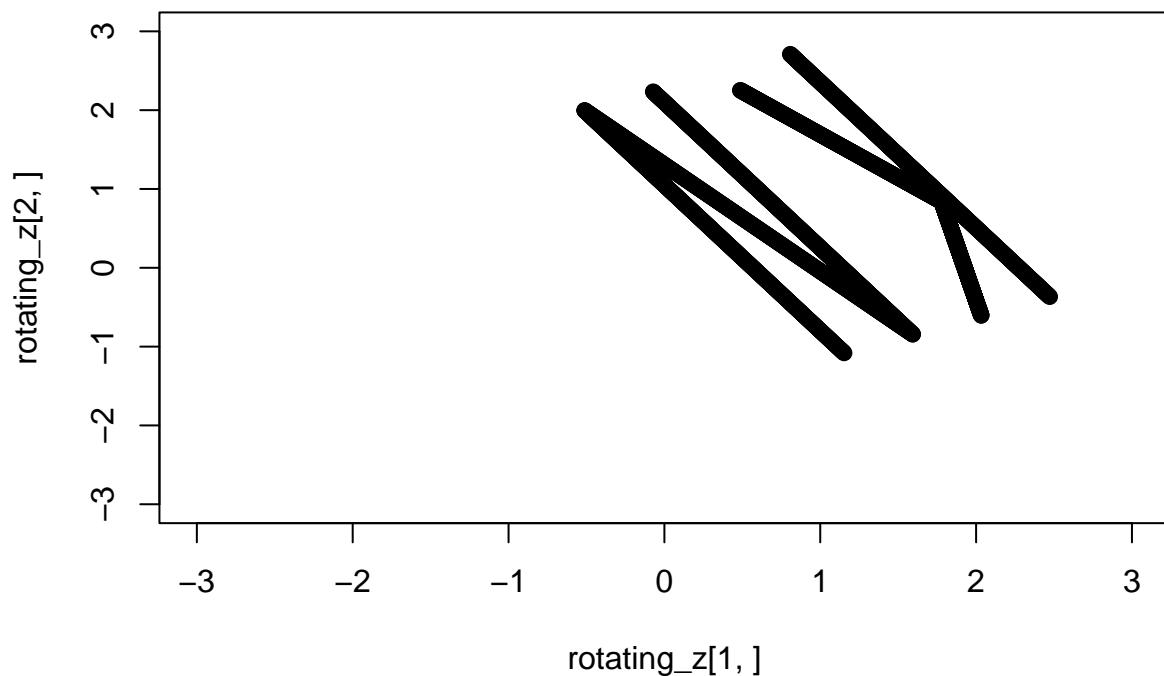


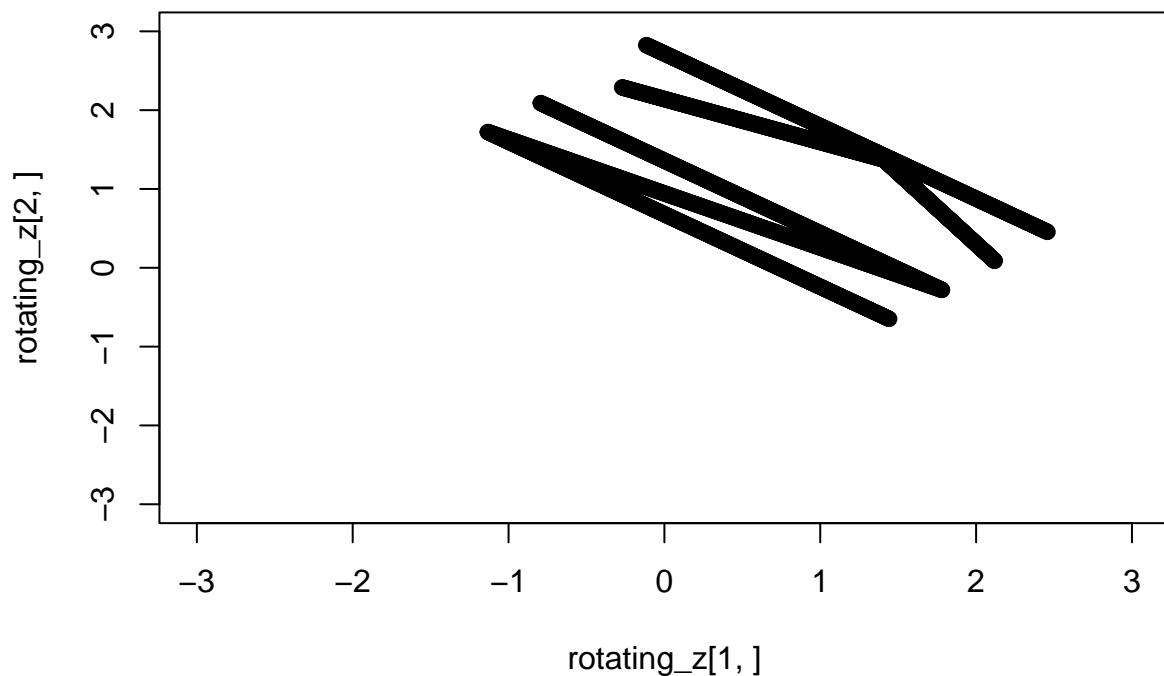


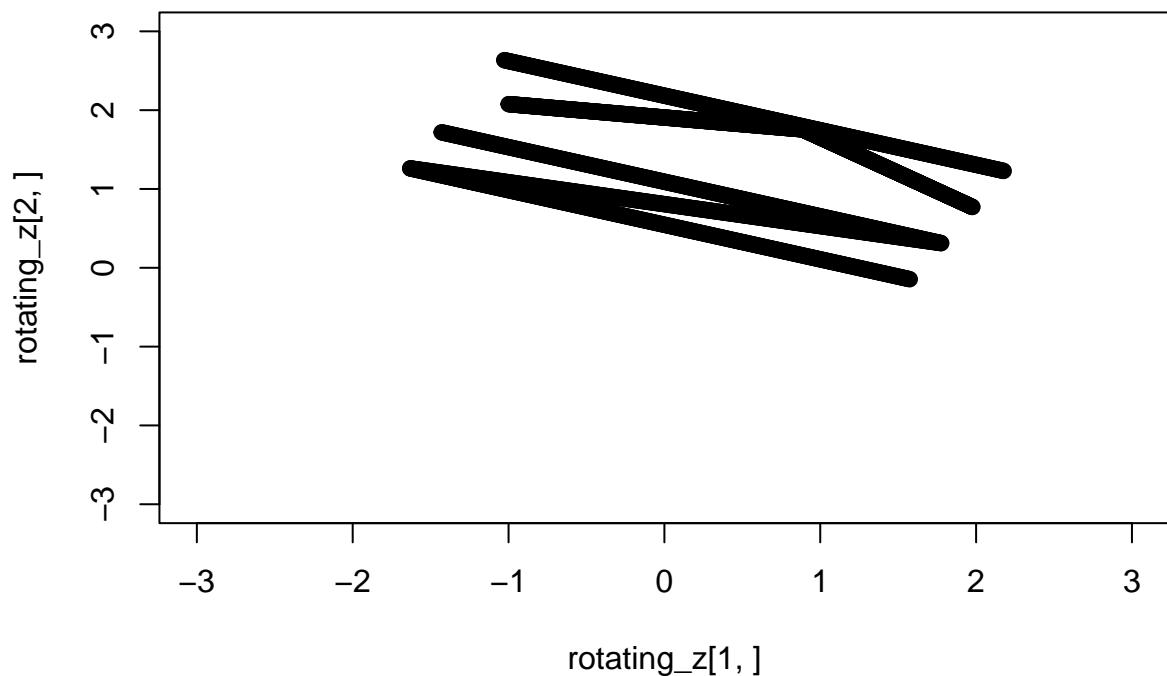


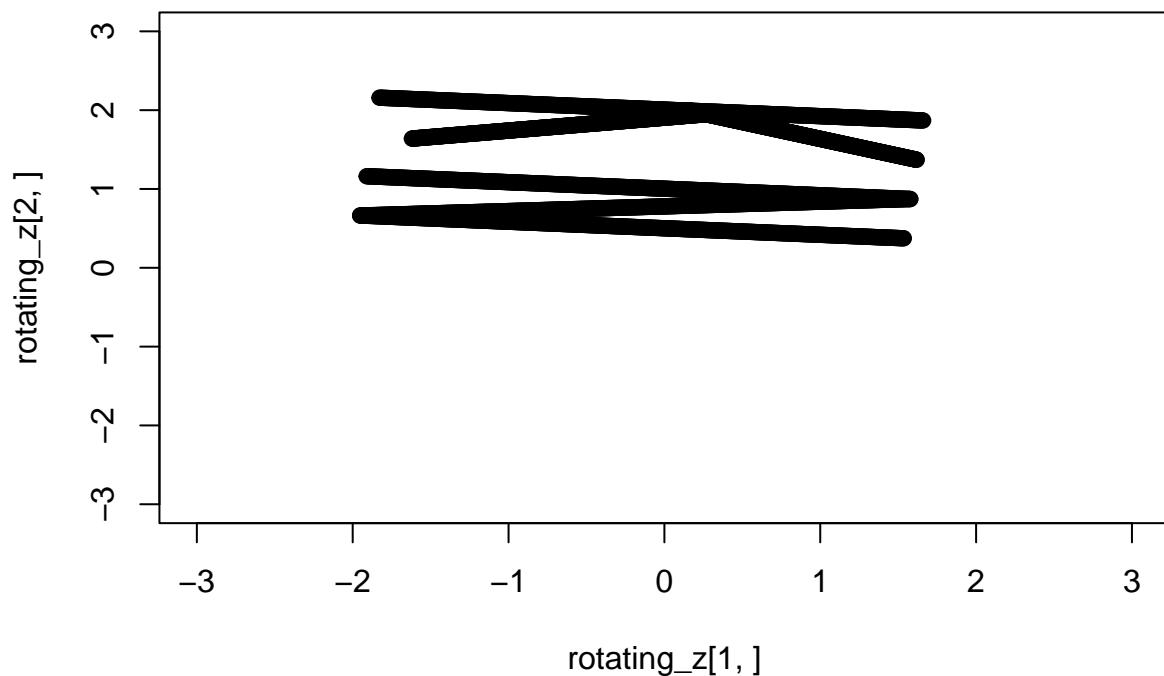


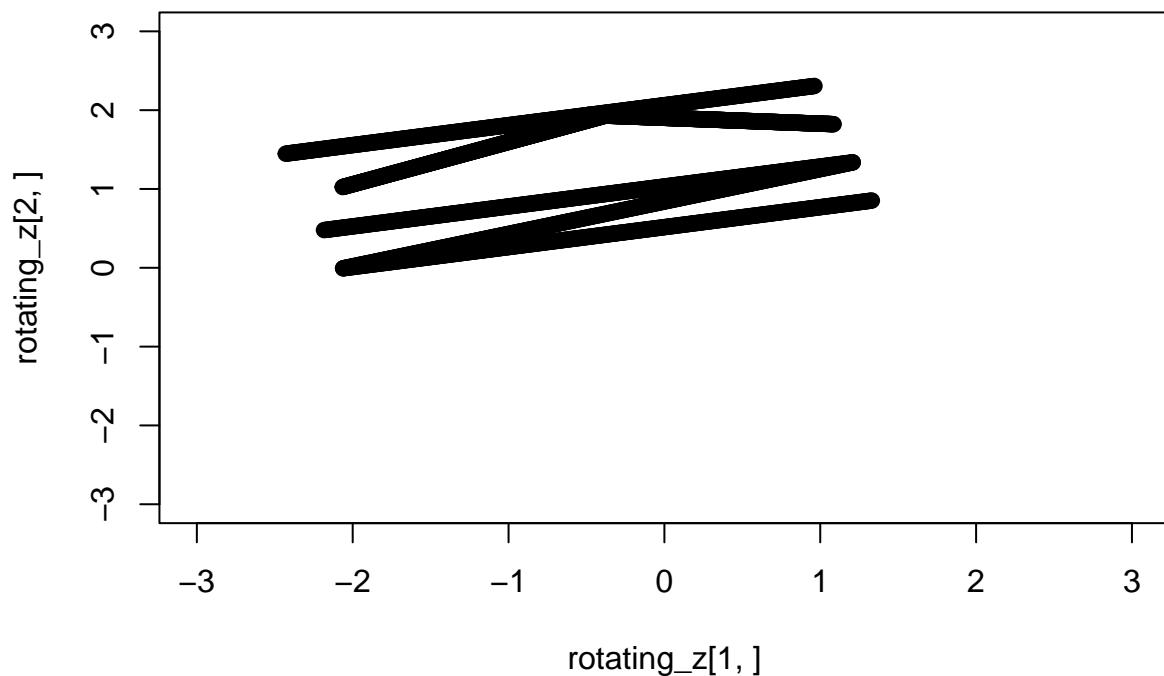


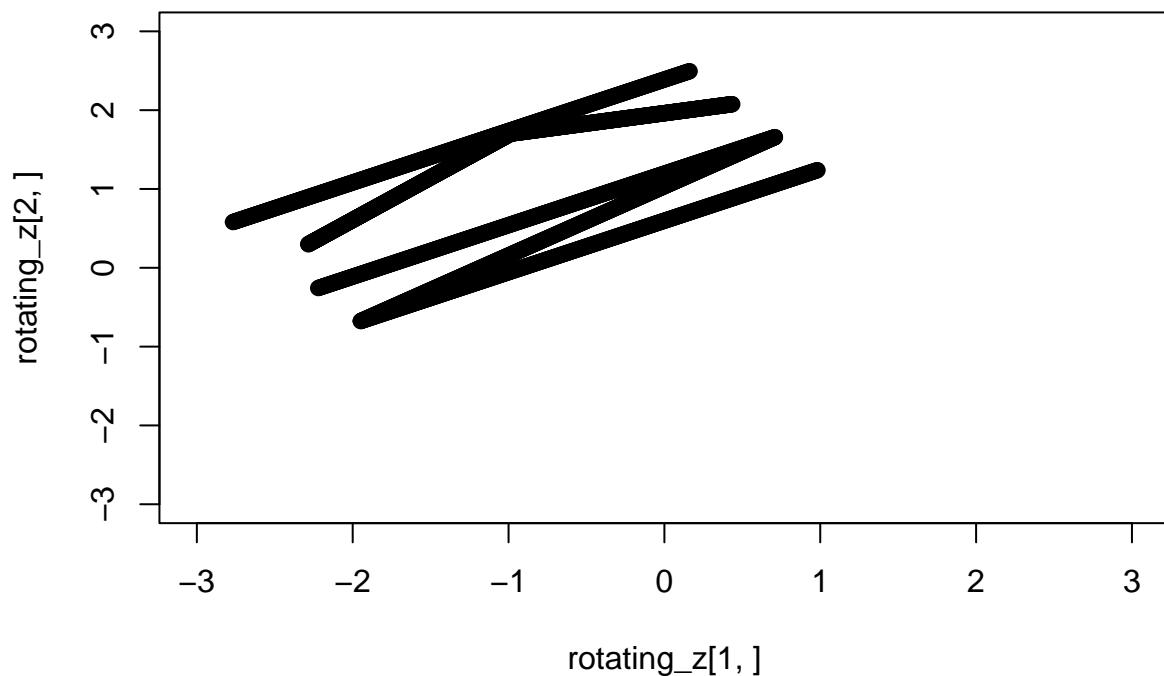


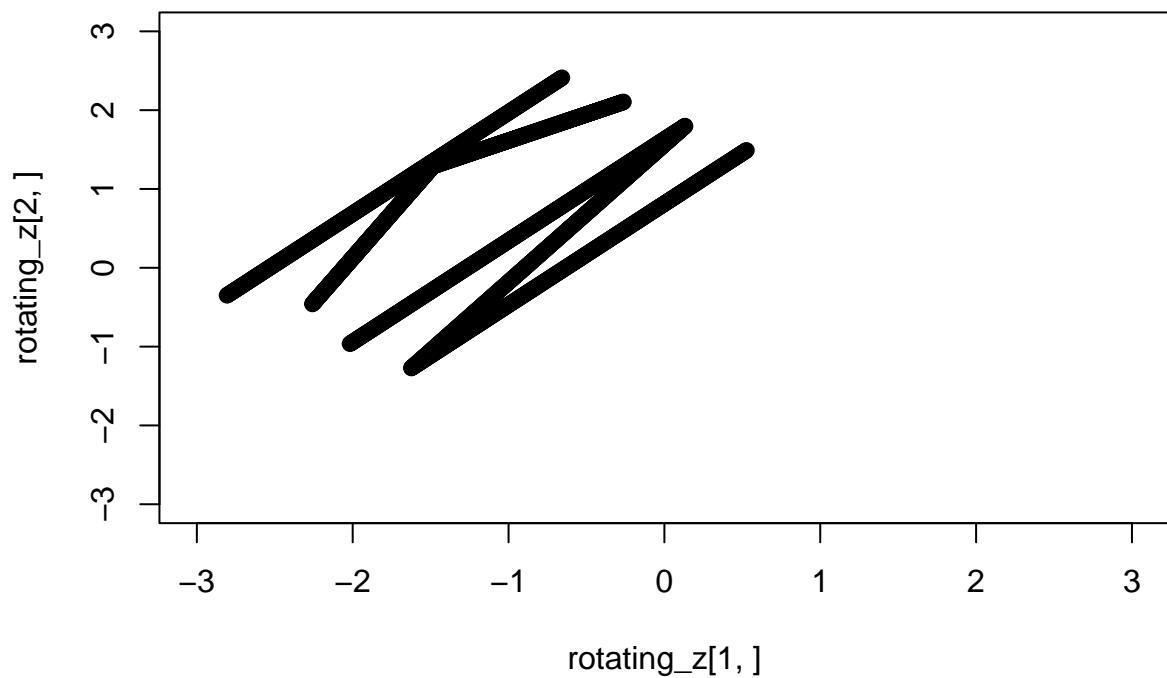


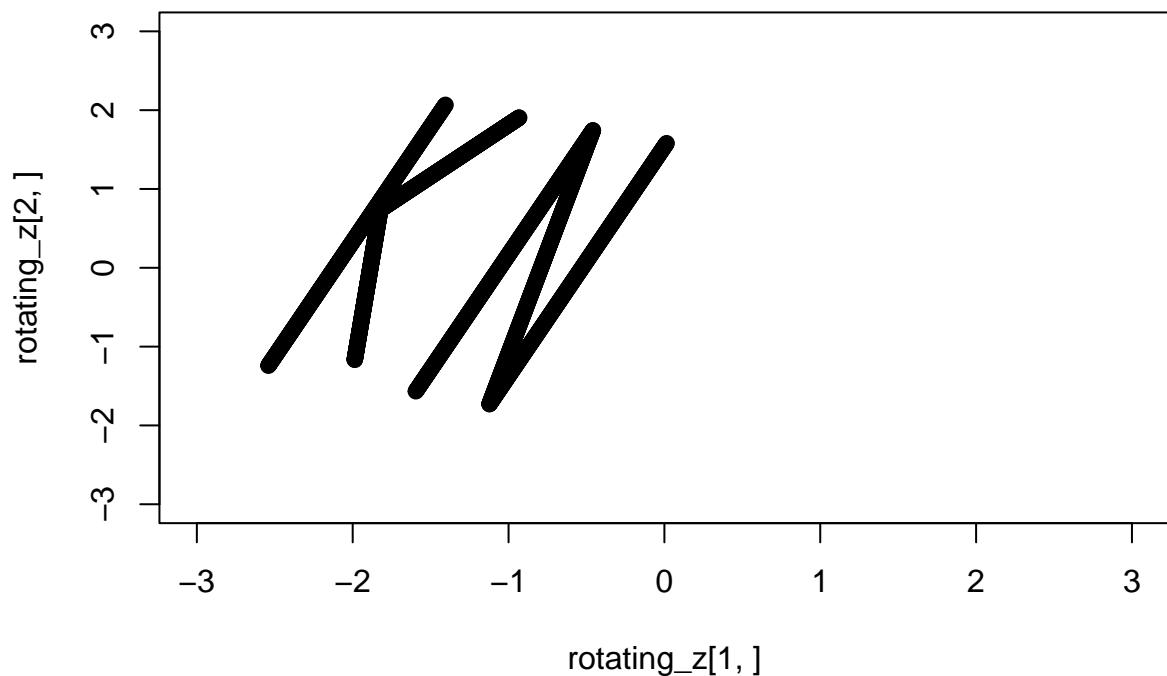


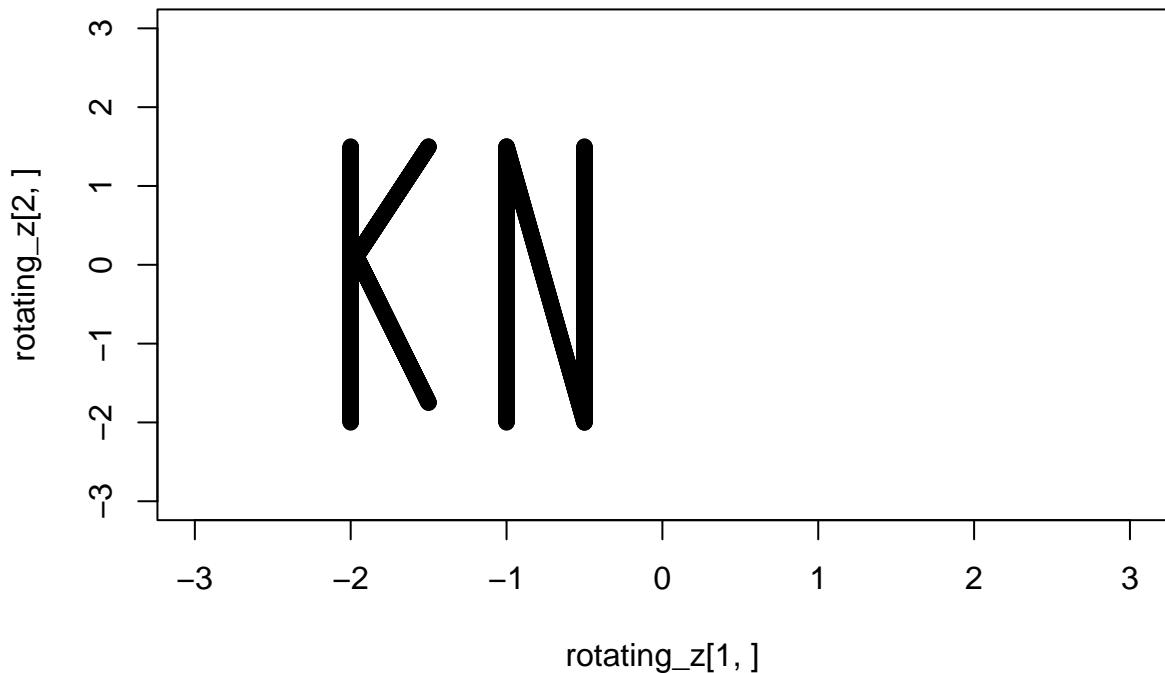












```
for (i in seq(0, 2 * pi, length.out = 20)) {  
  Z <- rbind(z, rep(0, ncol(z)))  
  ani_z <- apply(Z, 2, function(x) left_multiply(x, matrix(c(1, 0, 0, 0, cos(i), -sin(i), 0, sin(i), cos(i)), 4, 4)))  
  plot(ani_z[2,] ~ ani_z[1,], xlim = c(-3, 3), ylim = c(-3, 3))  
}
```

