

Spokes

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Spokes

```
knitr::opts_knit$set(echo = TRUE, root.dir = rprojroot::find_rstudio_root_file())
source(here('R', 'psc_sne.R'))
```

```
## Loading required package: foreach
## Loading required package: iterators
## Loading required package: SnowballC
## Loading required package: Rcpp
```

Sample on the $(\mathbb{S}^2)^{168}$ where $p = 2$, $r = 168$ and $n = 177$.

```
load("spokes.RData")
n <- dim(dirs)[1]
p <- dim(dirs)[3]-1
r <- dim(dirs)[2]
spokes <- array(0, c(n, p+1, r))
for(i in seq_len(r)){
  spokes[,i] <- dirs[,i,]
}
```

Let's calculate the rho parameters based on a perplexity of 30:

```
#Time difference of 28.40103 mins
rho_spokes_perp30 <- rho_optim_parallel(spokes, 30)

## Time difference of 22.30073 mins
to_perp(spokes, rho_spokes_perp30, cosine_polysph(spokes))

## [1] 29.99894 29.99995 29.99915 29.99895 29.99984 29.99830 29.99944 29.99982
## [9] 29.99944 29.99959 29.99928 29.99882 29.99872 29.99947 29.99997 29.99970
## [17] 29.99867 29.99930 29.99869 29.99914 29.99985 29.99851 29.99932 29.99872
## [25] 29.99833 29.99933 29.99983 29.99915 29.99890 29.99920 29.99948 29.99992
## [33] 29.99882 29.99951 29.99926 29.99900 29.99953 29.99999 29.99893 29.99915
## [41] 29.99870 29.99942 29.99926 29.99904 29.99988 29.99991 29.99935 29.99990
## [49] 29.99911 29.99920 29.99922 29.99914 29.99957 29.99837 29.99924 29.99991
## [57] 29.99907 29.99921 29.99925 29.99947 29.99888 29.99832 29.99927 29.99924
## [65] 29.99973 29.99909 29.99806 29.99891 29.99902 29.99907 29.99911 29.99925
## [73] 29.99868 29.99978 29.99941 29.99995 29.99937 29.99762 29.99993 29.99995
## [81] 29.99861 29.99924 29.99863 29.99994 29.99873 29.99931 29.99952 29.99943
## [89] 29.99878 29.99905 29.99905 29.99940 29.99897 29.99942 29.99870 29.99897
## [97] 29.99894 29.99961 29.99903 29.99954 29.99931 29.99914 29.99900 29.99924
```

```

## [105] 29.99998 29.99884 29.99972 29.99904 29.99928 29.99909 29.99968 29.99950
## [113] 29.99938 29.99999 29.99943 29.99920 29.99934 29.99860 29.99869 29.99927
## [121] 29.99998 29.99993 29.99900 29.99972 29.99950 29.99942 29.99993 29.99992
## [129] 29.99854 29.99890 30.00000 29.99837 29.99926 29.99882 29.99955 29.99940
## [137] 29.99813 29.99788 29.99907 29.99921 29.99878 29.99945 29.99868 29.99854
## [145] 29.99859 29.99921 29.99929 29.99895 29.99960 29.99976 29.99899 29.99911
## [153] 29.99915 29.99812 29.99955 29.99910 29.99852 29.99907 29.99836 29.99861
## [161] 29.99860 29.99903 29.99997 29.99878 29.99892 29.99949 29.99835 29.99874
## [169] 29.99996 29.99918 29.99905 29.99896 29.99971 29.99946 29.99924 29.99949
## [177] 29.99875

# [1] 15.99908 15.99912 15.99902 15.99814 15.99885 15.99985 16.53955 15.99998 15.99933 15.99936 15.99
# [18] 15.99918 15.99936 15.99910 16.00000 15.99912 15.99938 15.99926 15.99985 15.99931 15.99922 15.99
# [35] 15.99997 15.99900 15.99960 15.99927 15.99883 15.99922 15.99867 15.99950 15.99908 15.99982 25.19
# [52] 15.99914 15.99945 15.99893 15.99891 15.99895 15.99908 15.99989 15.99956 15.99923 15.99842 15.99
# [69] 15.99994 15.99995 15.99927 15.99914 15.99999 15.99926 15.99904 15.99920 15.99946 15.99801 15.99
# [86] 15.99944 15.99899 15.99950 15.99899 15.99903 15.99907 15.99996 15.99946 15.99906 15.99913 15.99
# [103] 15.99951 15.99987 16.00000 15.99832 15.99945 15.99957 15.99937 15.99898 15.99976 15.99955 15.99
# [120] 15.99952 15.99959 15.99990 15.99942 15.99921 15.99996 15.99923 15.99794 15.99871 15.99791 15.99
# [137] 15.99876 15.99853 15.99899 15.99995 15.99917 15.99975 15.99847 15.99864 15.99925 15.99939 15.99
# [154] 15.99863 15.99971 15.99934 15.99838 15.99895 15.99834 15.99914 15.99998 15.99876 15.99994 15.99
# [171] 15.99897 15.99836 15.99905 16.13348 15.99902 18.53126 15.99907

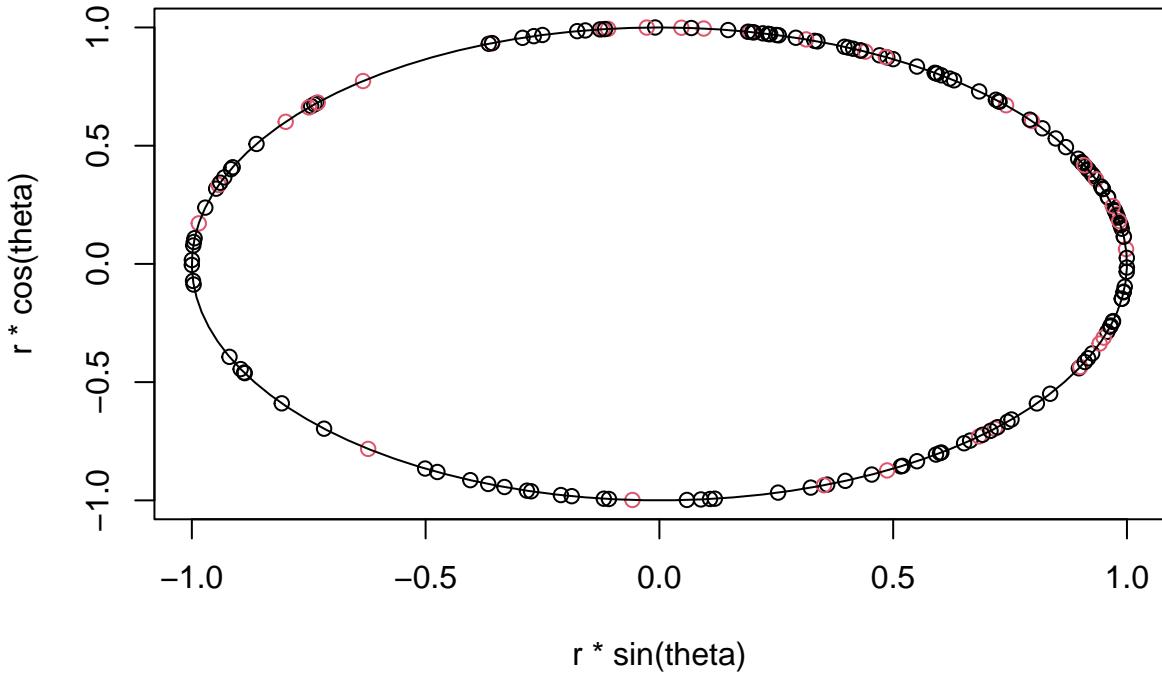
```

First, let's reduce to dimension \mathbb{S}^1 then $d = 1$ (circumference):

```
Y <- psc_sne(spokes, d=1, rho_psc_list = rho_spokes_perp30, colors = ifelse(ids_labs, 2, 1), num_iterat
```

```

## [1] "Iteration 1"
## [1] "Iteration 1: objective function value is 12.089419"
```

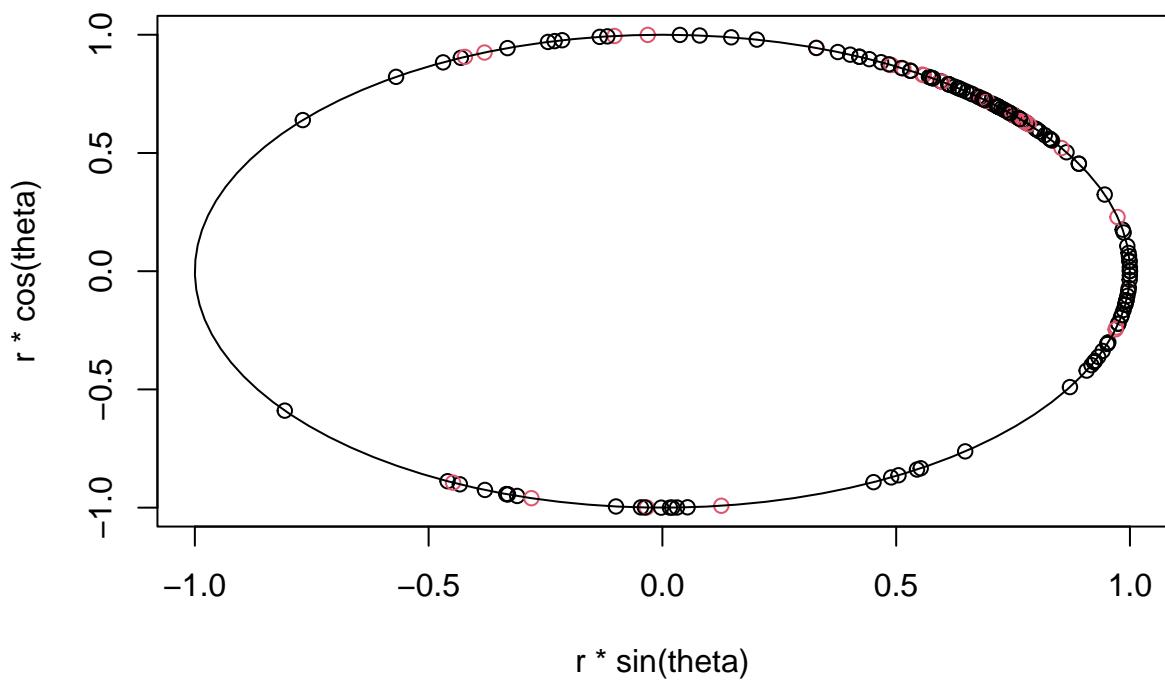


```

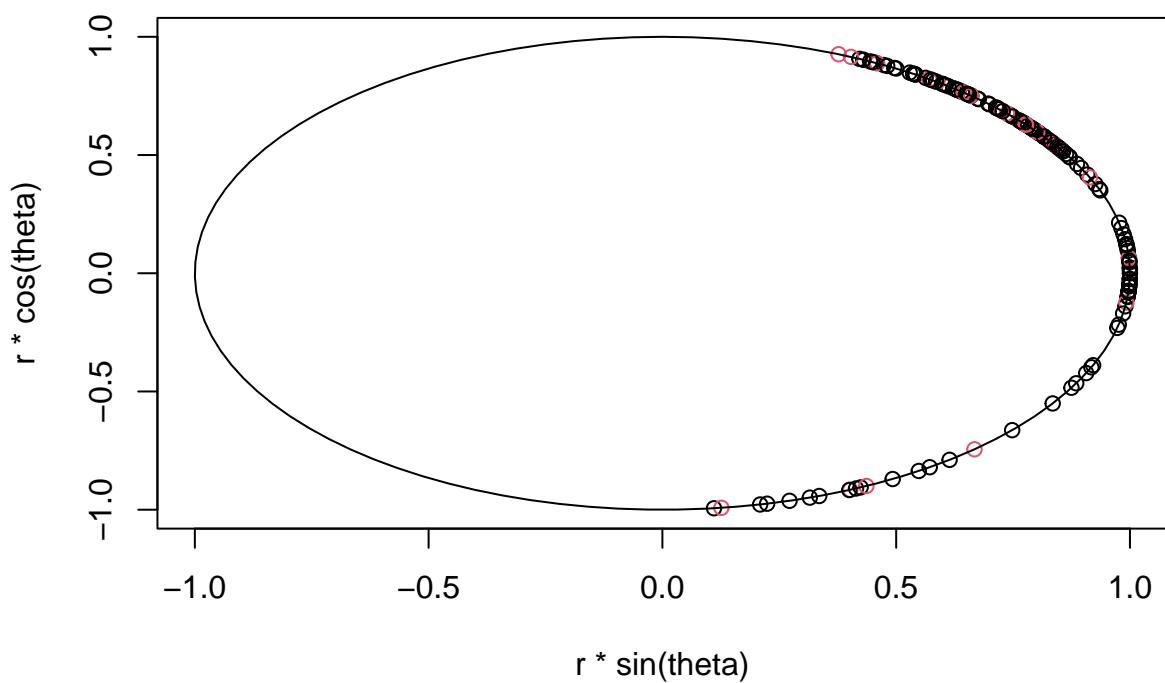
## [1] "Iteration 2"
## [1] "Iteration 3"
## [1] "Iteration 4"
## [1] "Iteration 5"

```

```
## [1] "Iteration 5: objective function value is 11.017419"
```

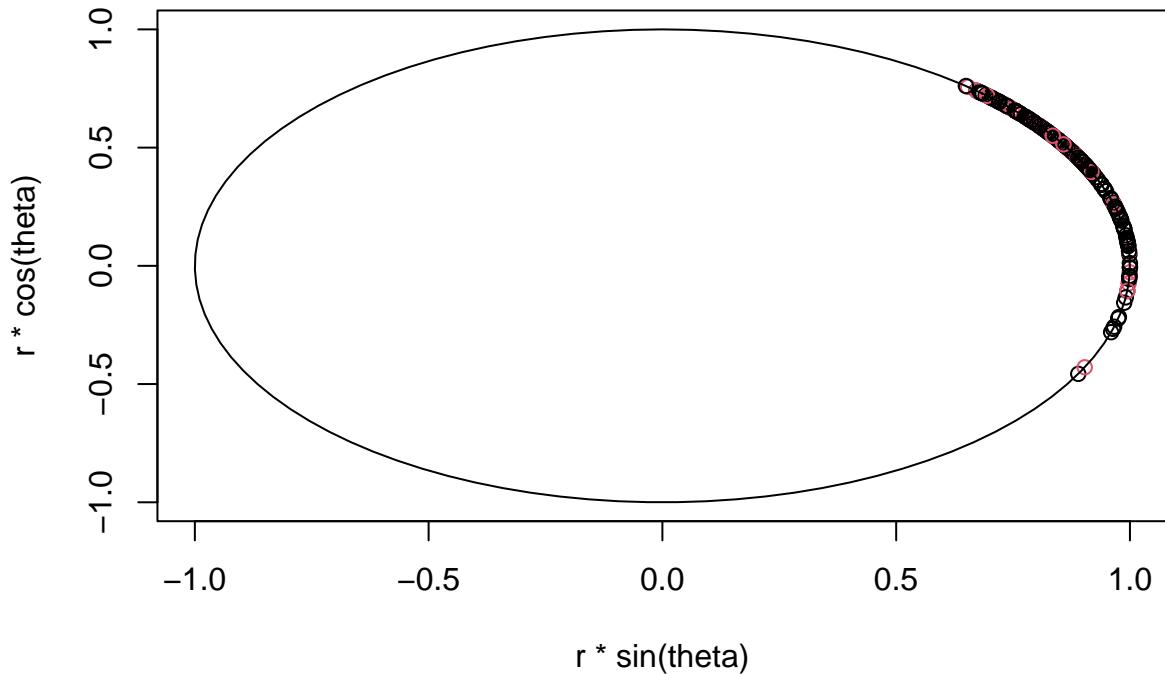


```
## [1] "Iteration 6"  
## [1] "Iteration 7"  
## [1] "Iteration 8"  
## [1] "Iteration 9"  
## [1] "Iteration 10"  
## [1] "Iteration 10: objective function value is 11.163911"
```

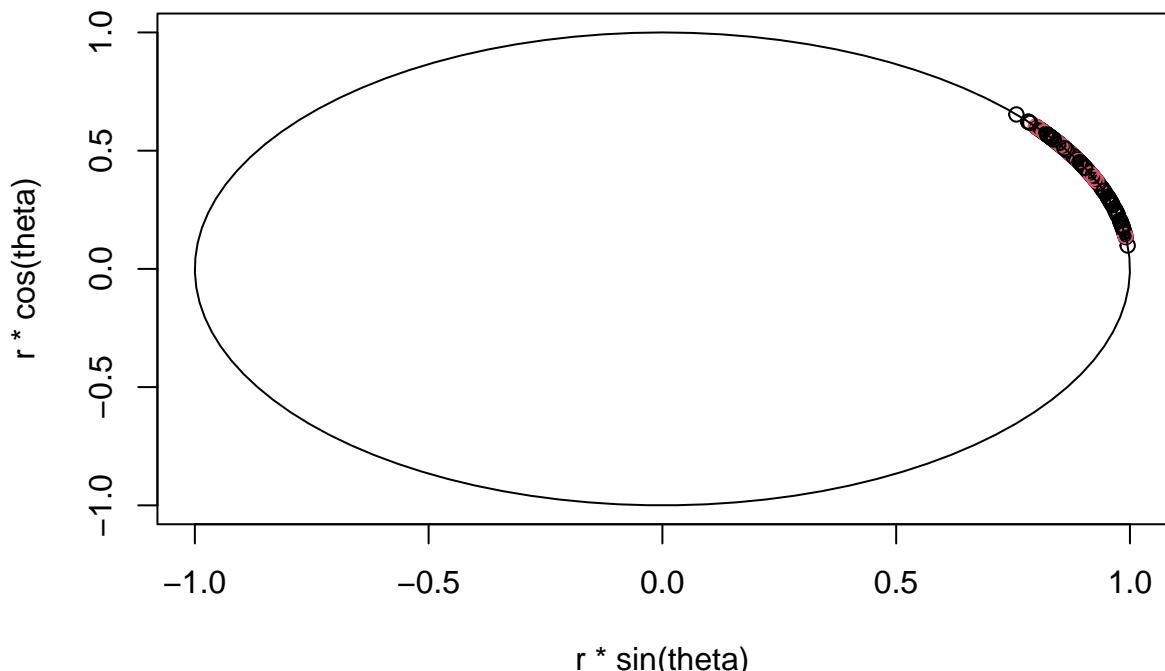


```
## [1] "Iteration 11"  
## [1] "Iteration 12"
```

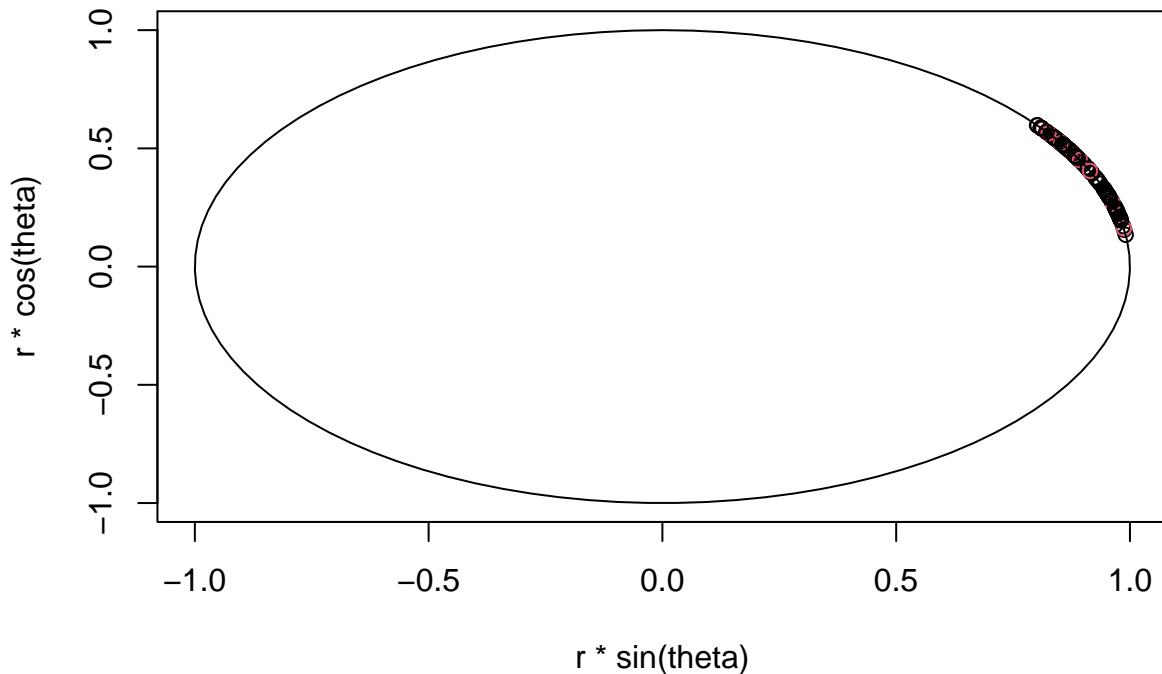
```
## [1] "Iteration 13"  
## [1] "Iteration 14"  
## [1] "Iteration 15"  
## [1] "Iteration 15: objective function value is 11.414472"
```



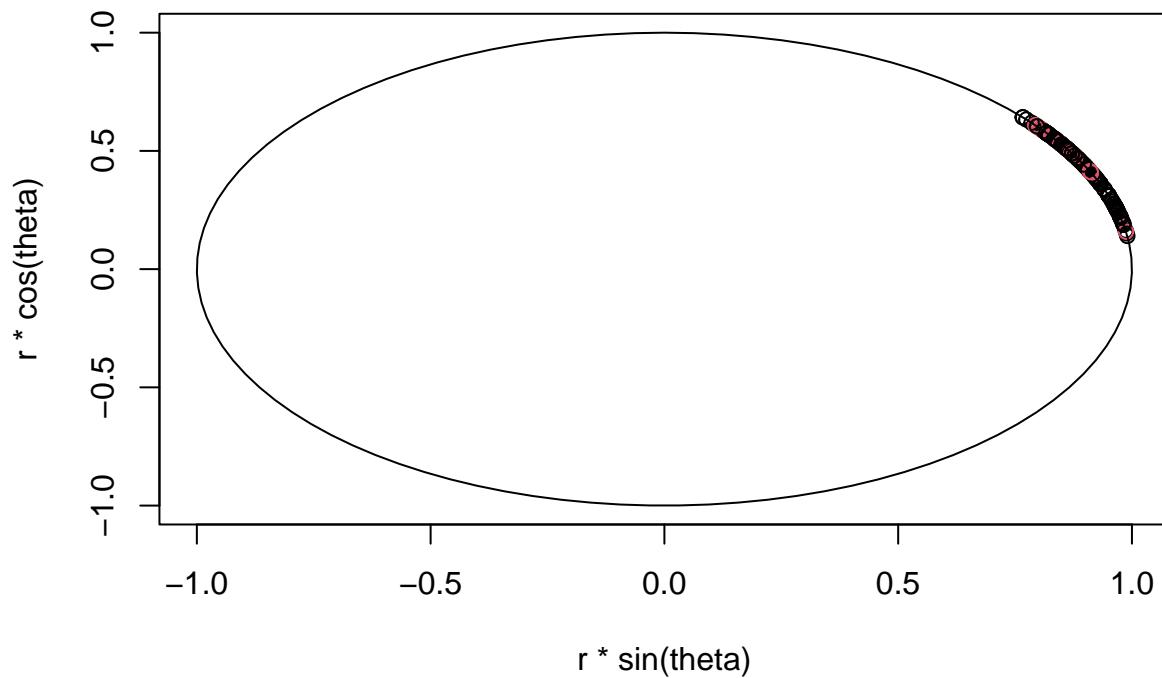
```
## [1] "Iteration 16"  
## [1] "Iteration 17"  
## [1] "Iteration 18"  
## [1] "Iteration 19"  
## [1] "Iteration 20"  
## [1] "Iteration 20: objective function value is 11.680813"
```



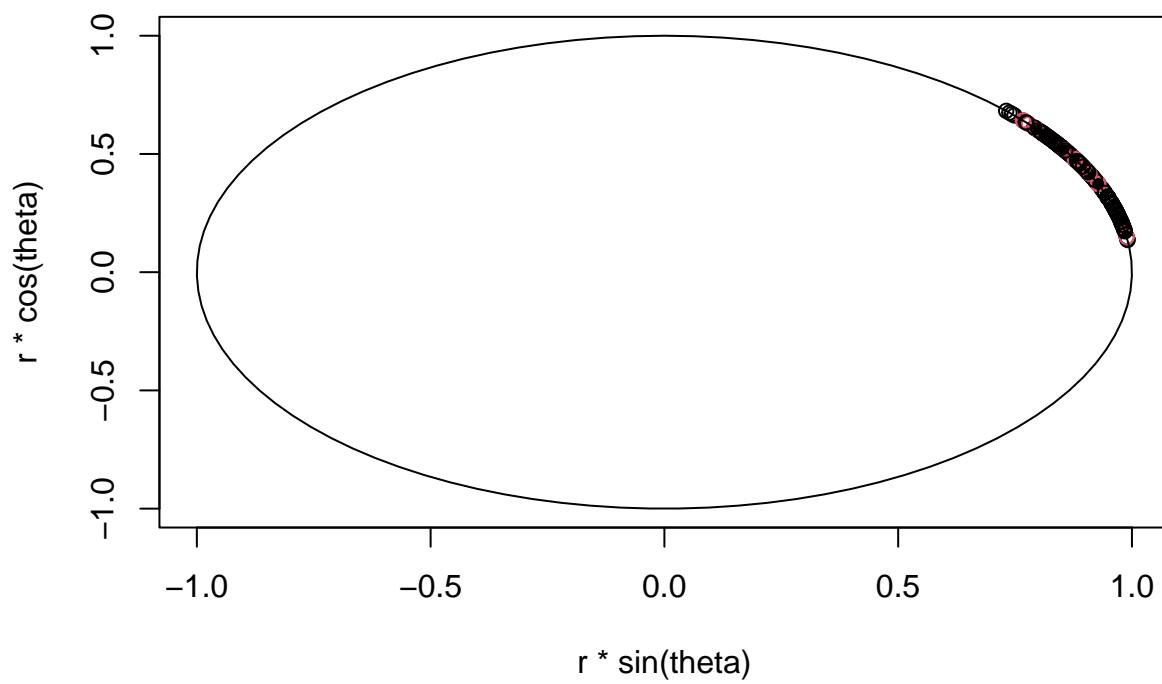
```
## [1] "Iteration 21"  
## [1] "Iteration 22"  
## [1] "Iteration 23"  
## [1] "Iteration 24"  
## [1] "Iteration 25"  
## [1] "Iteration 25: objective function value is 11.713528"
```



```
## [1] "Iteration 26"  
## [1] "Iteration 27"  
## [1] "Iteration 28"  
## [1] "Iteration 29"  
## [1] "Iteration 30"  
## [1] "Iteration 30: objective function value is 11.686165"
```

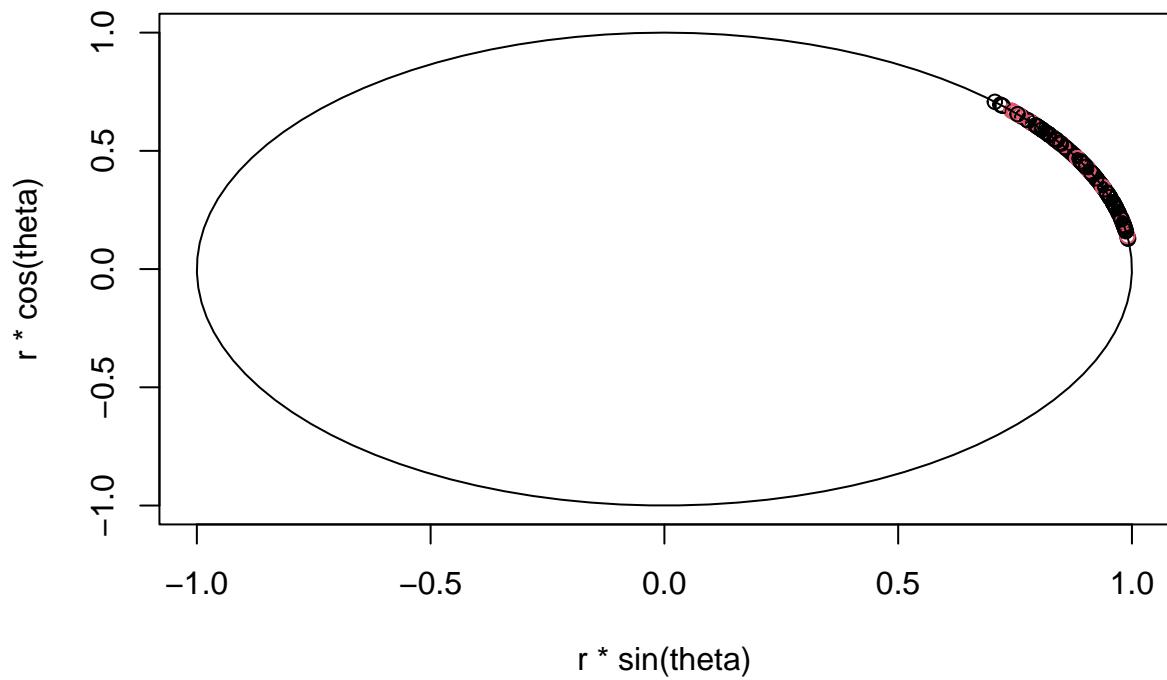


```
## [1] "Iteration 31"  
## [1] "Iteration 32"  
## [1] "Iteration 33"  
## [1] "Iteration 34"  
## [1] "Iteration 35"  
## [1] "Iteration 35: objective function value is 11.645138"
```

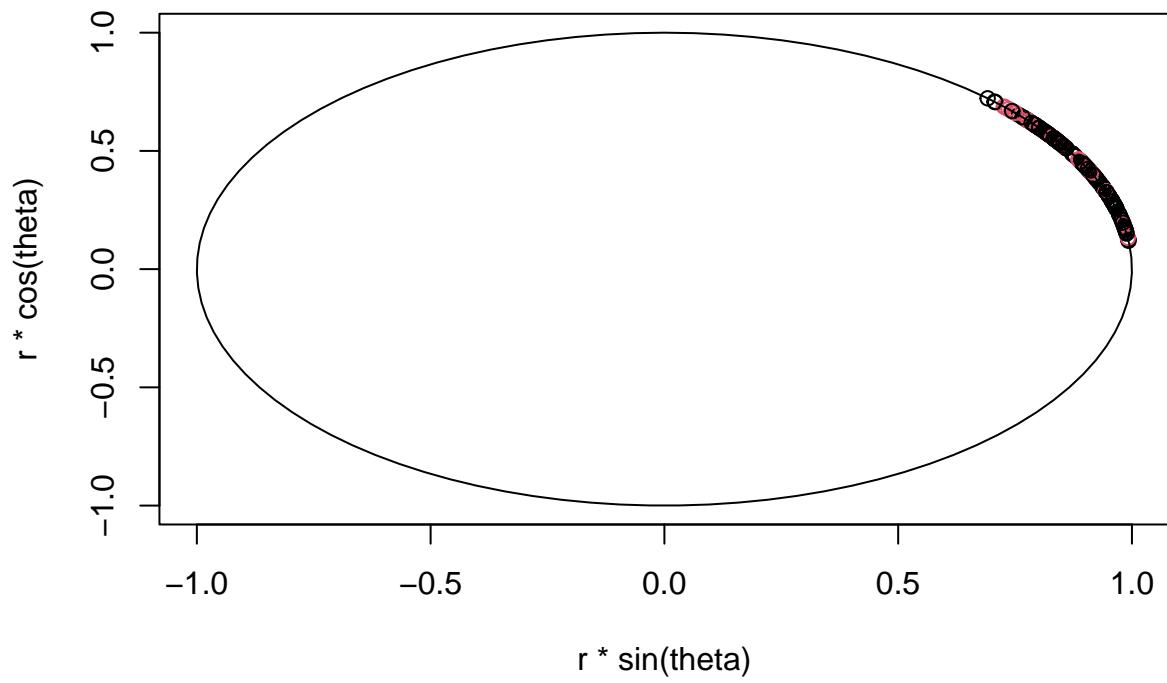


```
## [1] "Iteration 36"  
## [1] "Iteration 37"  
## [1] "Iteration 38"  
## [1] "Iteration 39"
```

```
## [1] "Iteration 40"  
## [1] "Iteration 40: objective function value is 11.608918"
```

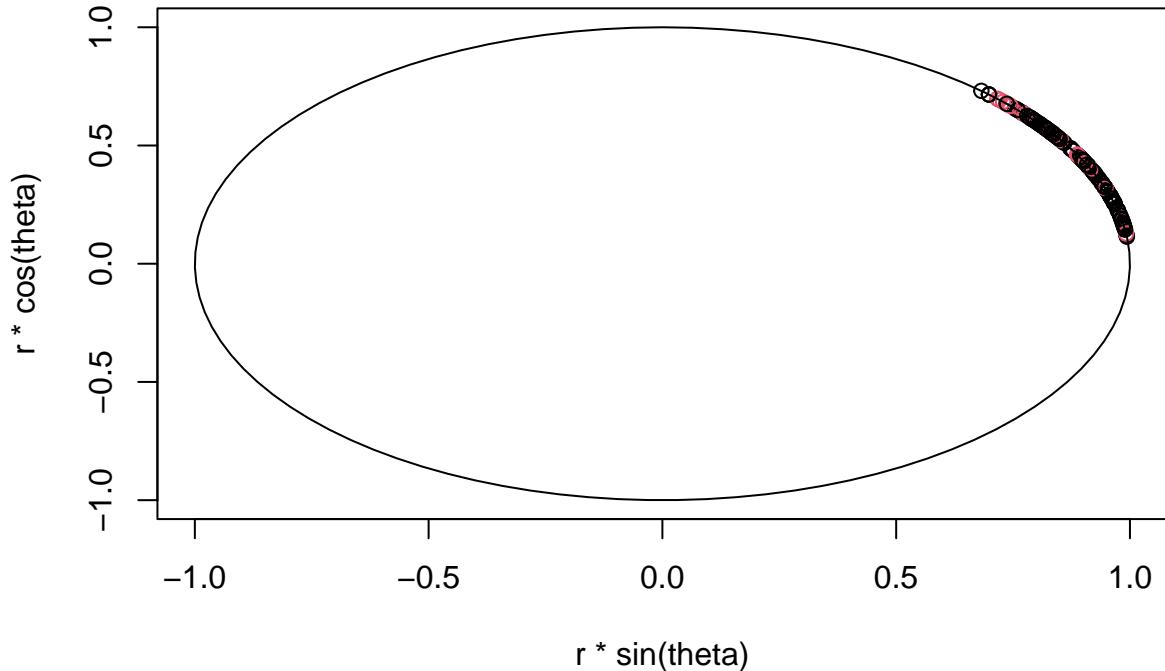


```
## [1] "Iteration 41"  
## [1] "Iteration 42"  
## [1] "Iteration 43"  
## [1] "Iteration 44"  
## [1] "Iteration 45"  
## [1] "Iteration 45: objective function value is 11.583072"
```

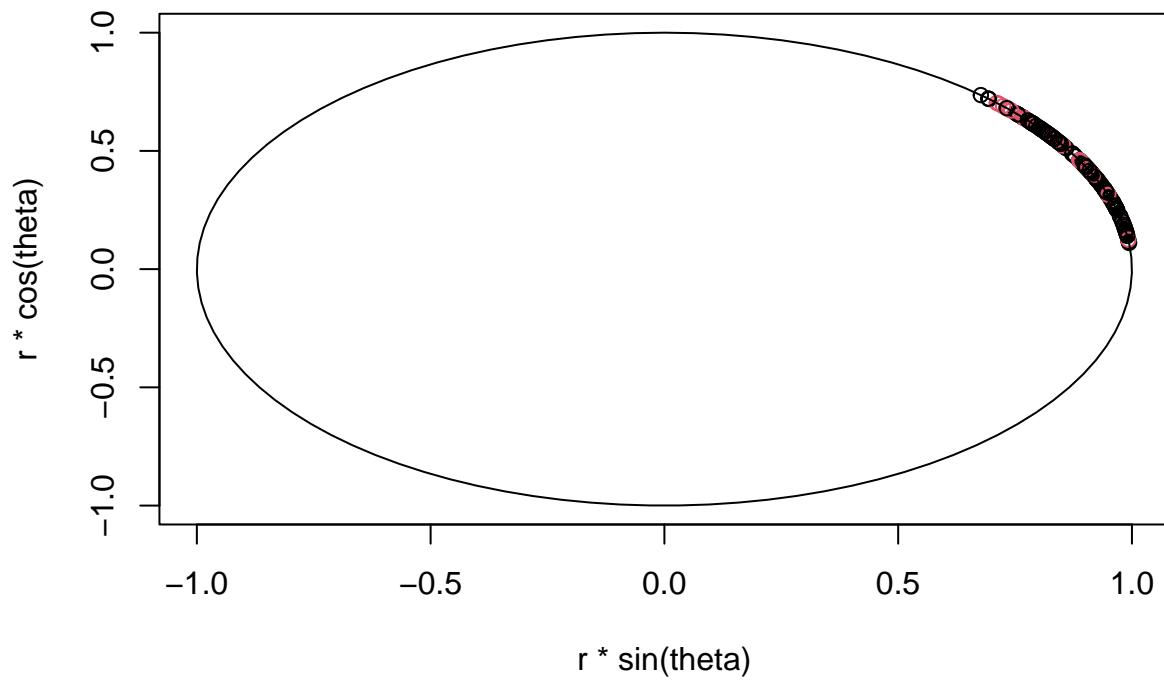


```
## [1] "Iteration 46"
```

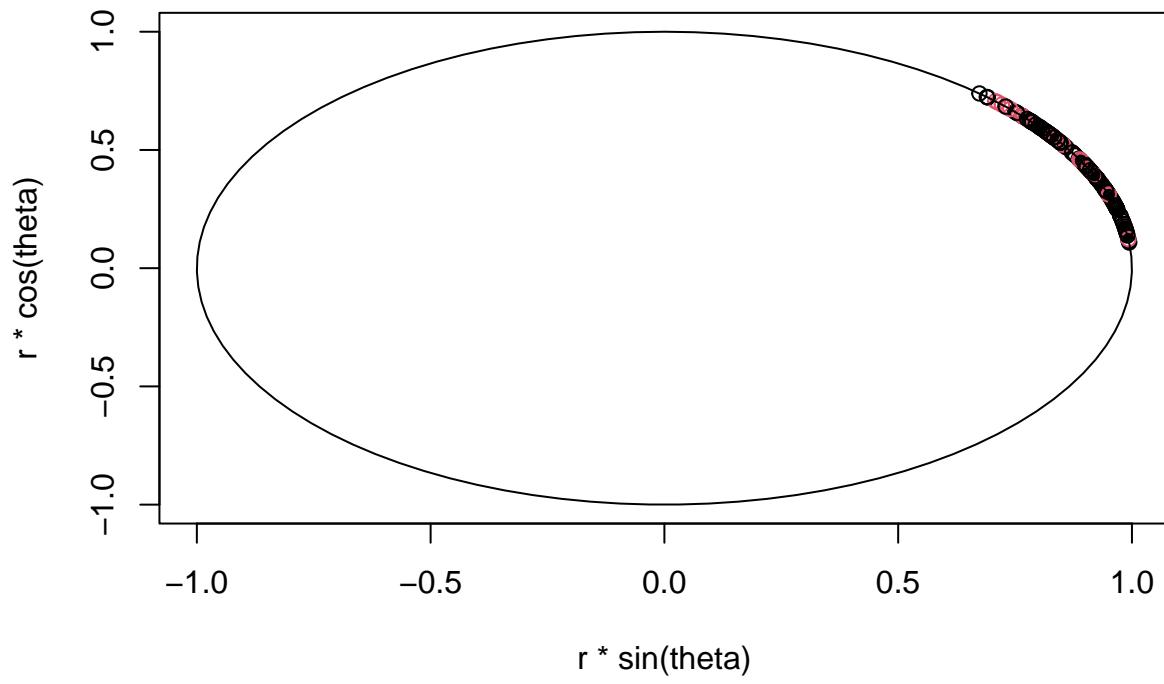
```
## [1] "Iteration 47"  
## [1] "Iteration 48"  
## [1] "Iteration 49"  
## [1] "Iteration 50"  
## [1] "Iteration 50: objective function value is 11.566548"
```



```
## [1] "Iteration 51"  
## [1] "Iteration 52"  
## [1] "Iteration 53"  
## [1] "Iteration 54"  
## [1] "Iteration 55"  
## [1] "Iteration 55: objective function value is 11.556579"
```

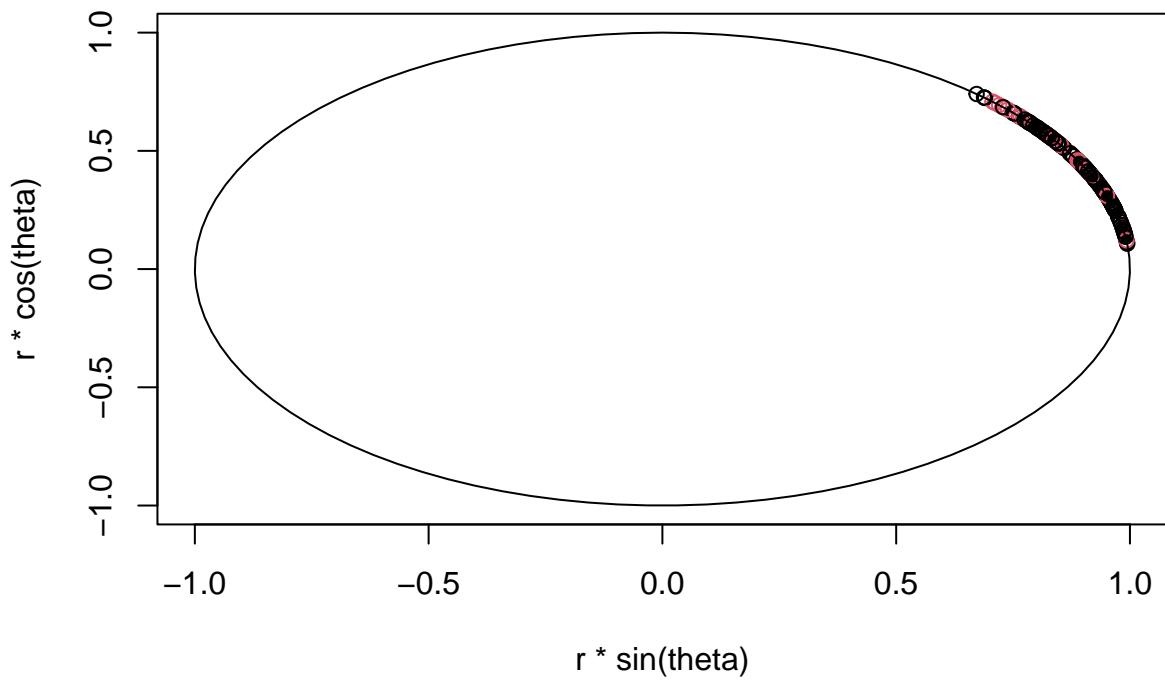


```
## [1] "Iteration 56"
## [1] "Iteration 57"
## [1] "Iteration 58"
## [1] "Iteration 59"
## [1] "Iteration 60"
## [1] "Iteration 60: objective function value is 11.550746"
```

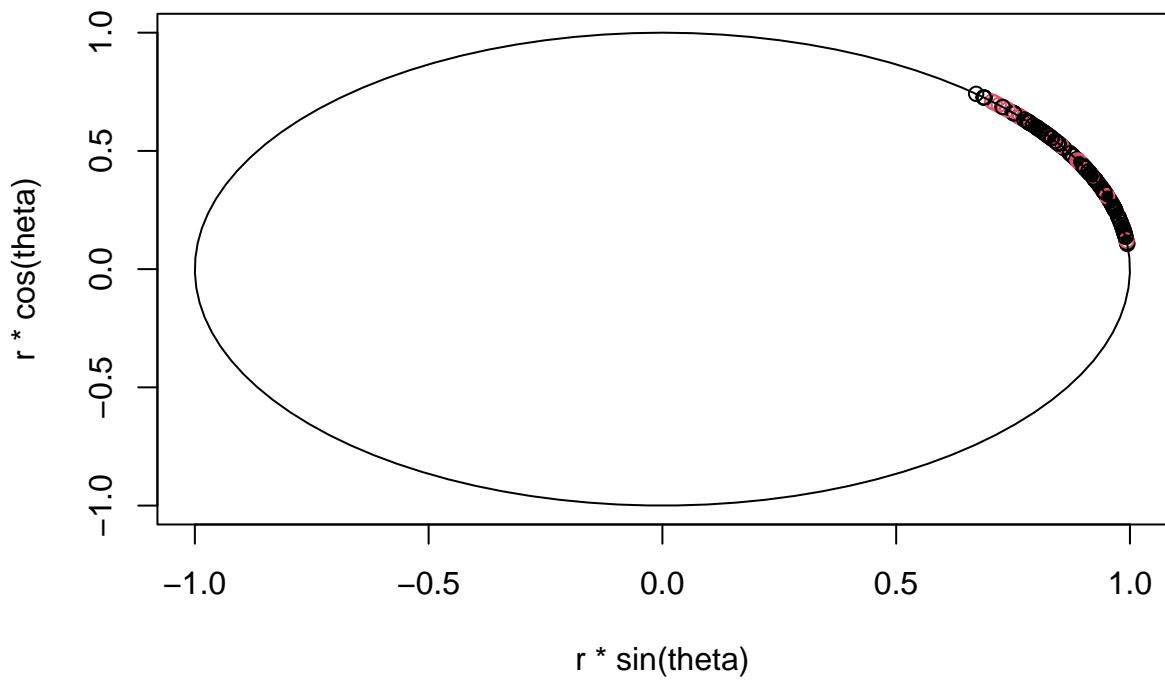


```
## [1] "Iteration 61"
## [1] "Iteration 62"
## [1] "Iteration 63"
## [1] "Iteration 64"
```

```
## [1] "Iteration 65"  
## [1] "Iteration 65: objective function value is 11.547390"
```

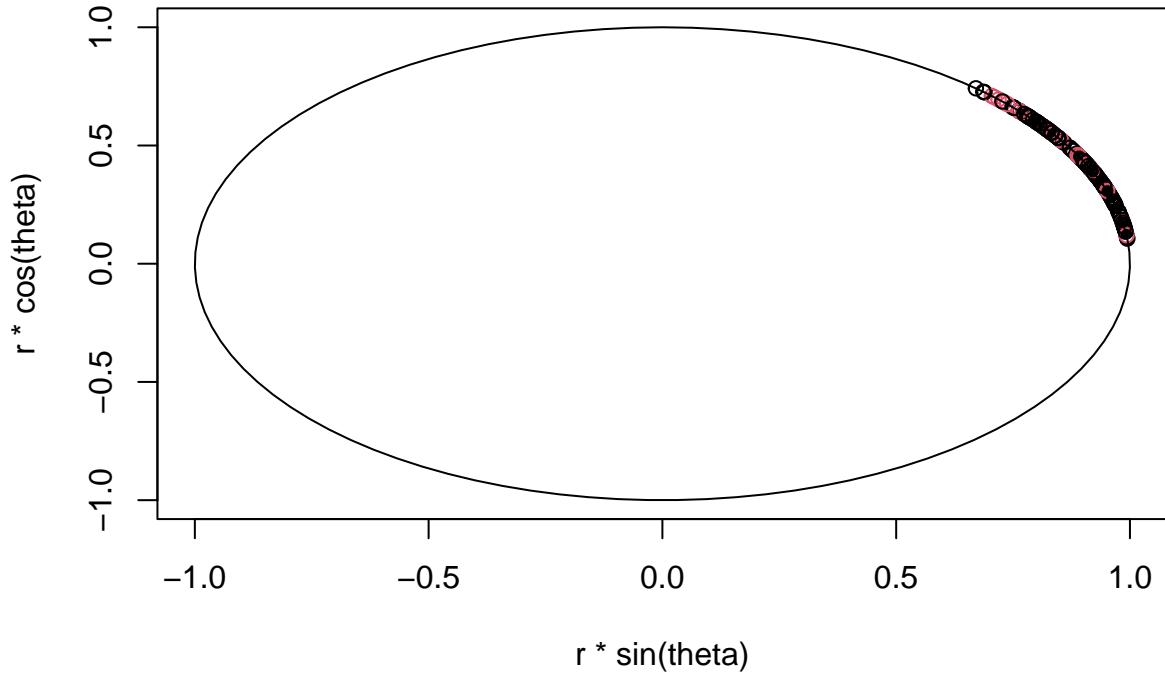


```
## [1] "Iteration 66"  
## [1] "Iteration 67"  
## [1] "Iteration 68"  
## [1] "Iteration 69"  
## [1] "Iteration 70"  
## [1] "Iteration 70: objective function value is 11.545476"
```

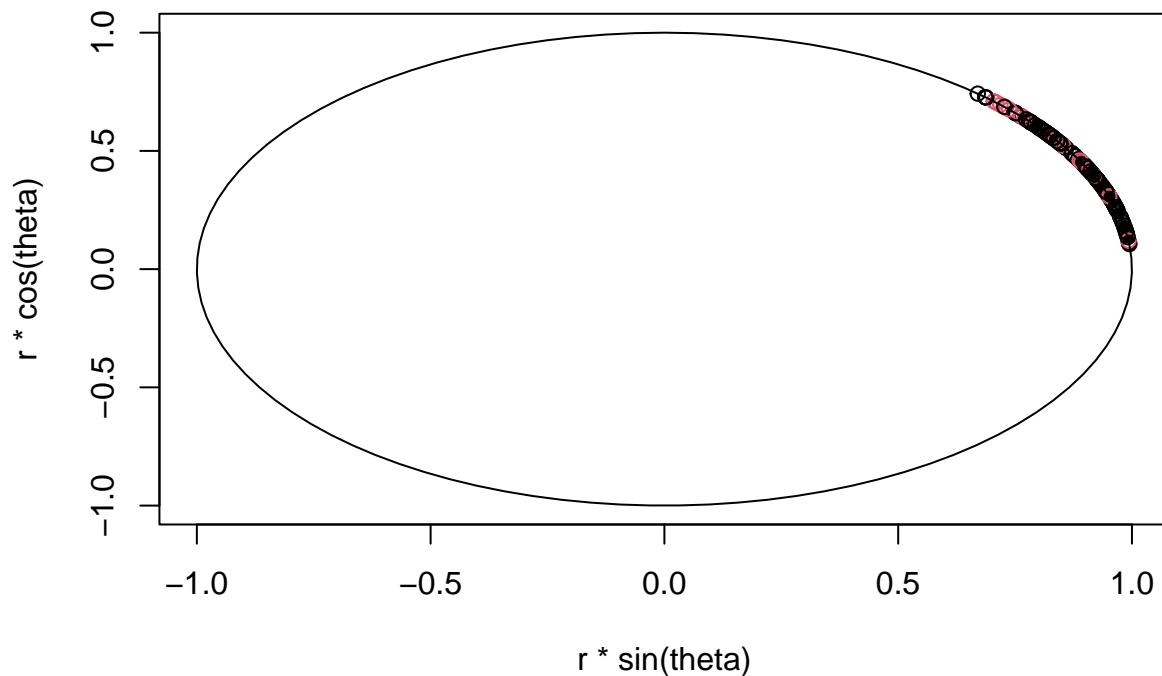


```
## [1] "Iteration 71"
```

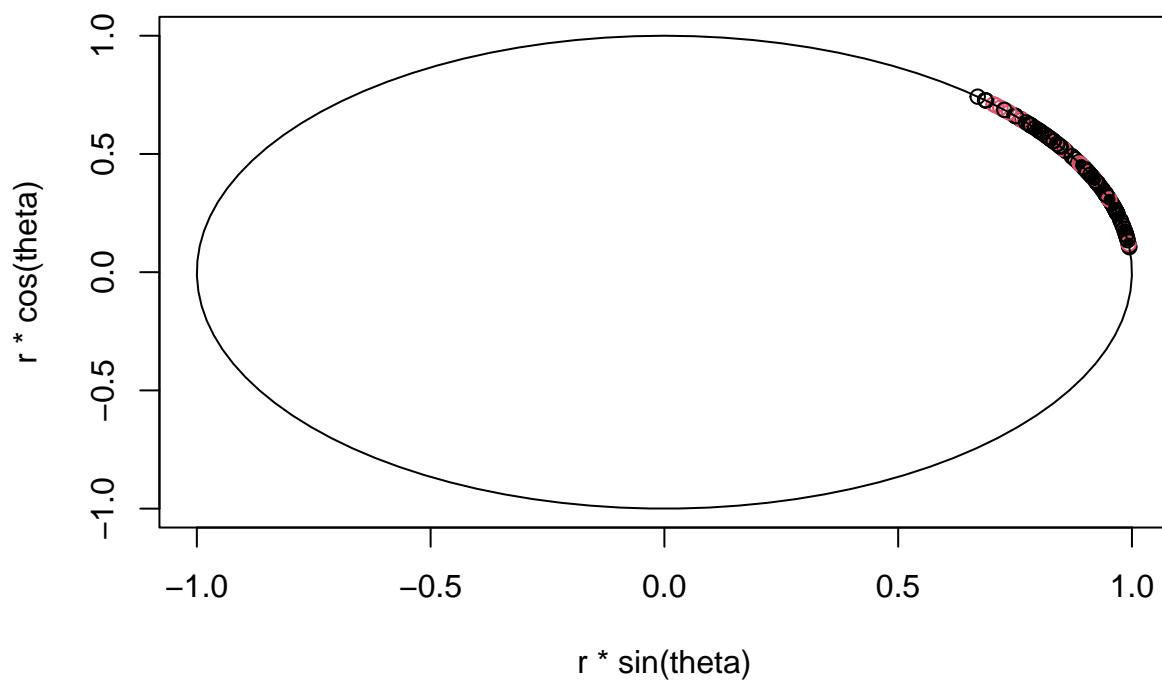
```
## [1] "Iteration 72"  
## [1] "Iteration 73"  
## [1] "Iteration 74"  
## [1] "Iteration 75"  
## [1] "Iteration 75: objective function value is 11.544391"
```



```
## [1] "Iteration 76"  
## [1] "Iteration 77"  
## [1] "Iteration 78"  
## [1] "Iteration 79"  
## [1] "Iteration 80"  
## [1] "Iteration 80: objective function value is 11.543776"
```

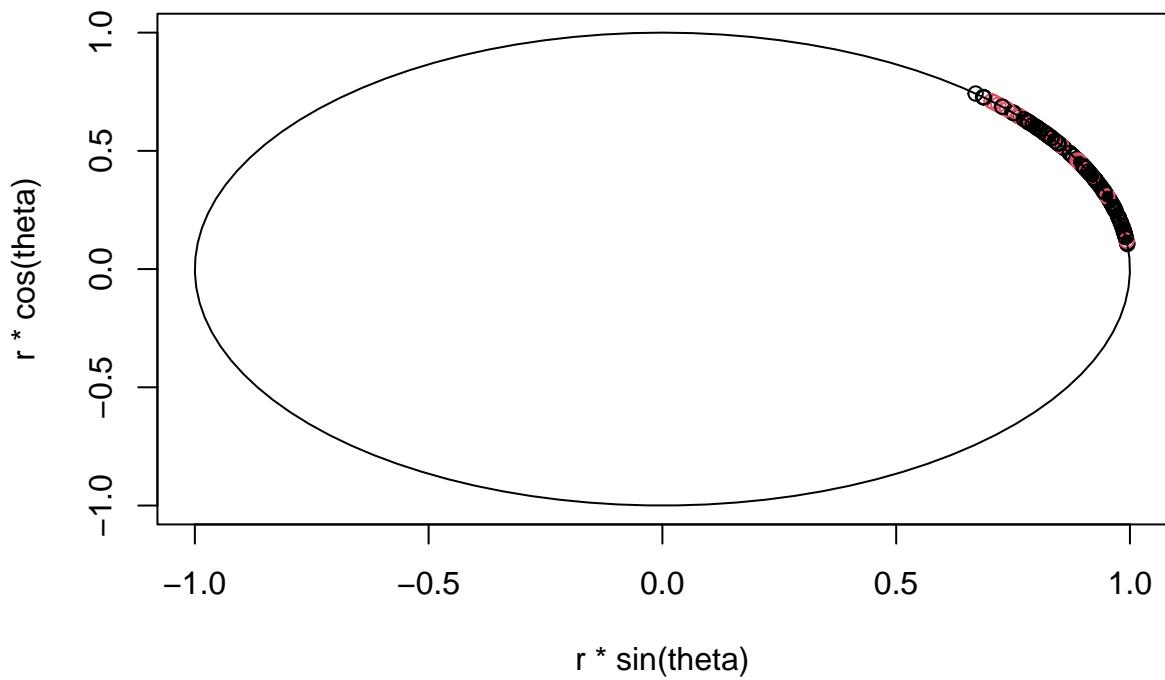


```
## [1] "Iteration 81"  
## [1] "Iteration 82"  
## [1] "Iteration 83"  
## [1] "Iteration 84"  
## [1] "Iteration 85"  
## [1] "Iteration 85: objective function value is 11.543429"
```

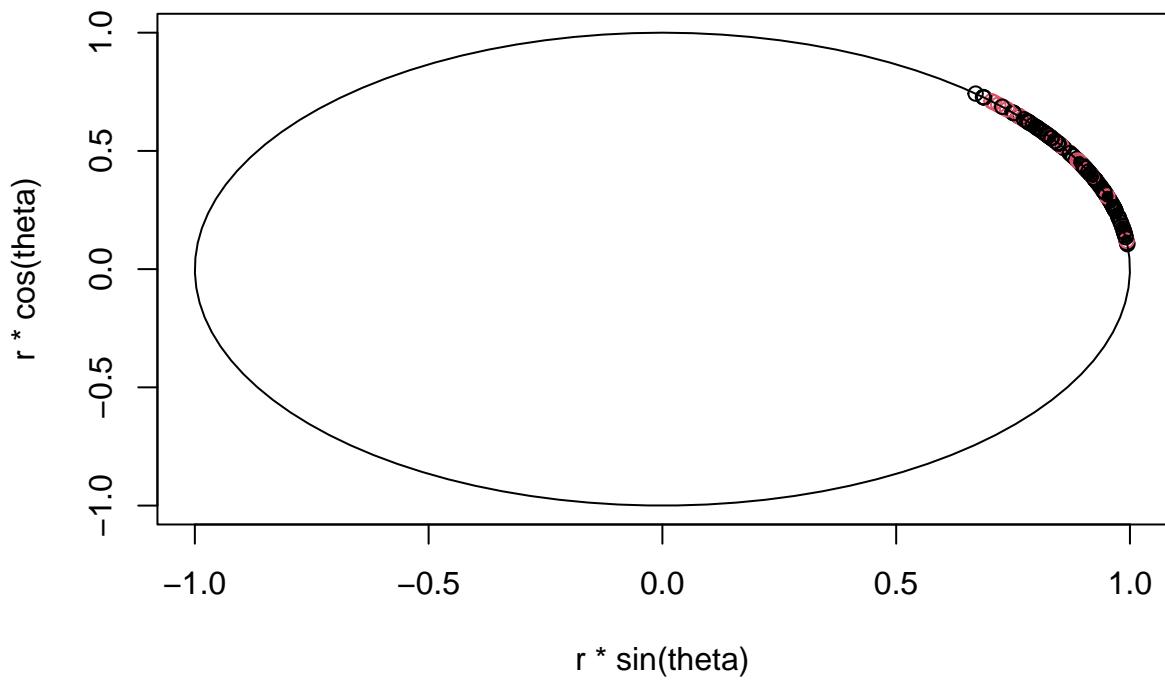


```
## [1] "Iteration 86"  
## [1] "Iteration 87"  
## [1] "Iteration 88"  
## [1] "Iteration 89"
```

```
## [1] "Iteration 90"  
## [1] "Iteration 90: objective function value is 11.543234"
```

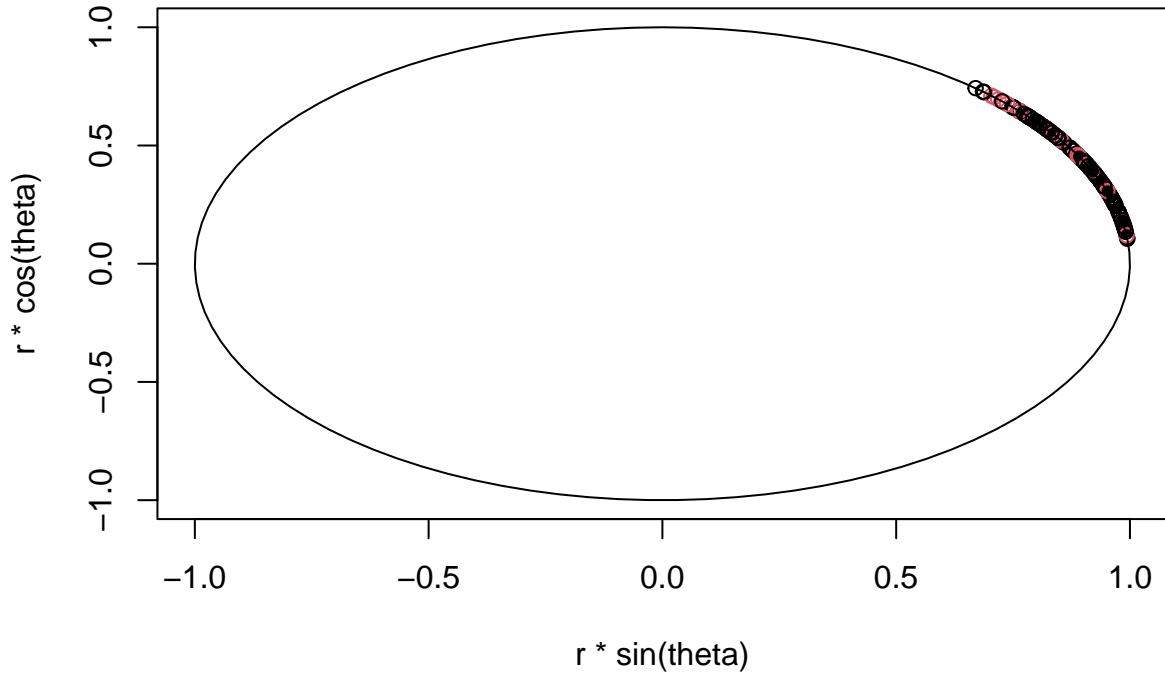


```
## [1] "Iteration 91"  
## [1] "Iteration 92"  
## [1] "Iteration 93"  
## [1] "Iteration 94"  
## [1] "Iteration 95"  
## [1] "Iteration 95: objective function value is 11.543123"
```

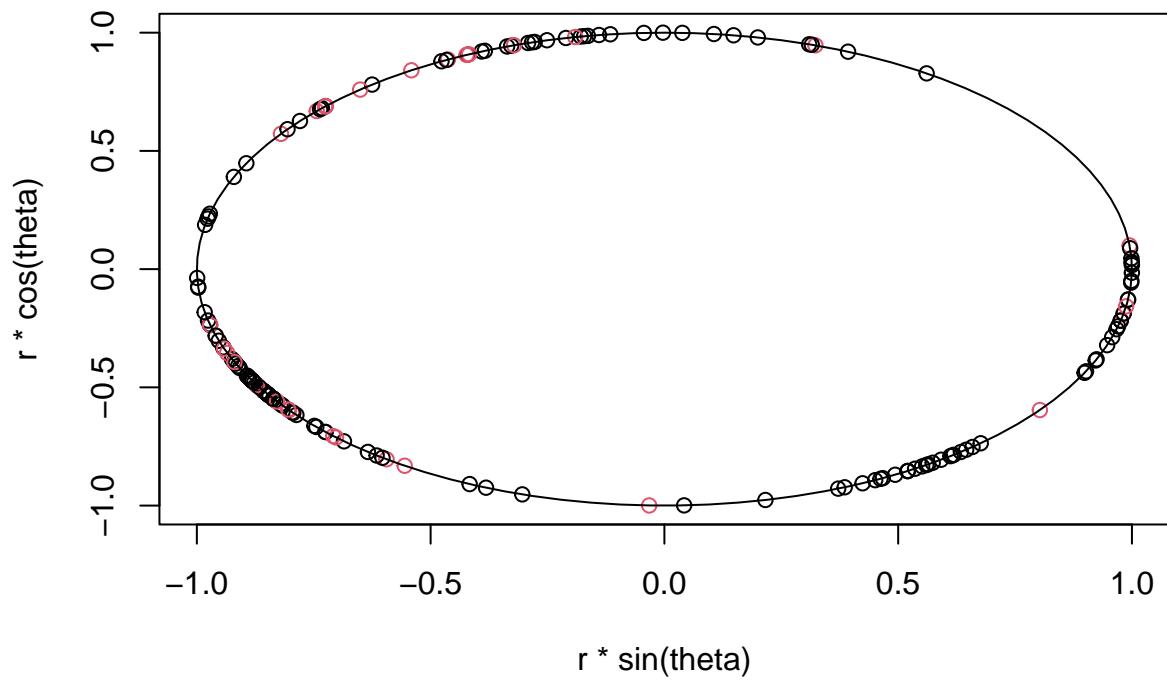


```
## [1] "Iteration 96"
```

```
## [1] "Iteration 97"  
## [1] "Iteration 98"  
## [1] "Iteration 99"  
## [1] "Iteration 100"  
## [1] "Iteration 100: objective function value is 1.499471"
```



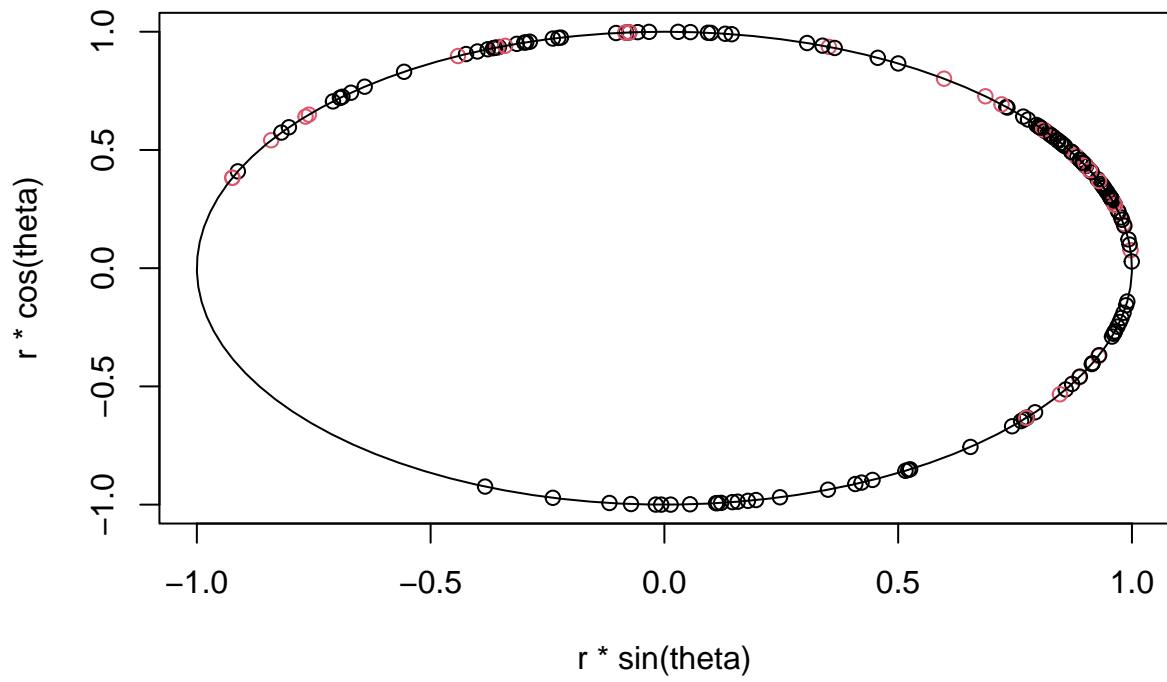
```
## [1] "Iteration 101"  
## [1] "Iteration 102"  
## [1] "Iteration 103"  
## [1] "Iteration 104"  
## [1] "Iteration 105"  
## [1] "Iteration 105: objective function value is 1.603411"
```



```

## [1] "Iteration 106"
## [1] "Iteration 107"
## [1] "Iteration 108"
## [1] "Iteration 109"
## [1] "Iteration 110"
## [1] "Iteration 110: objective function value is 1.522944"

```

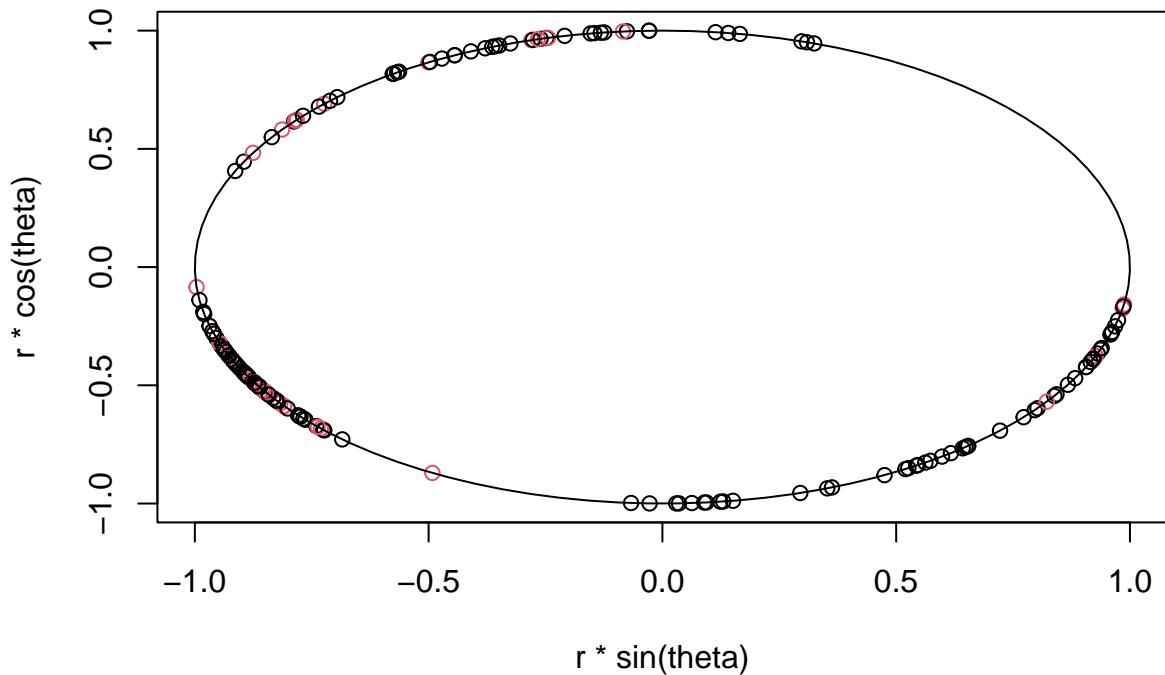


```

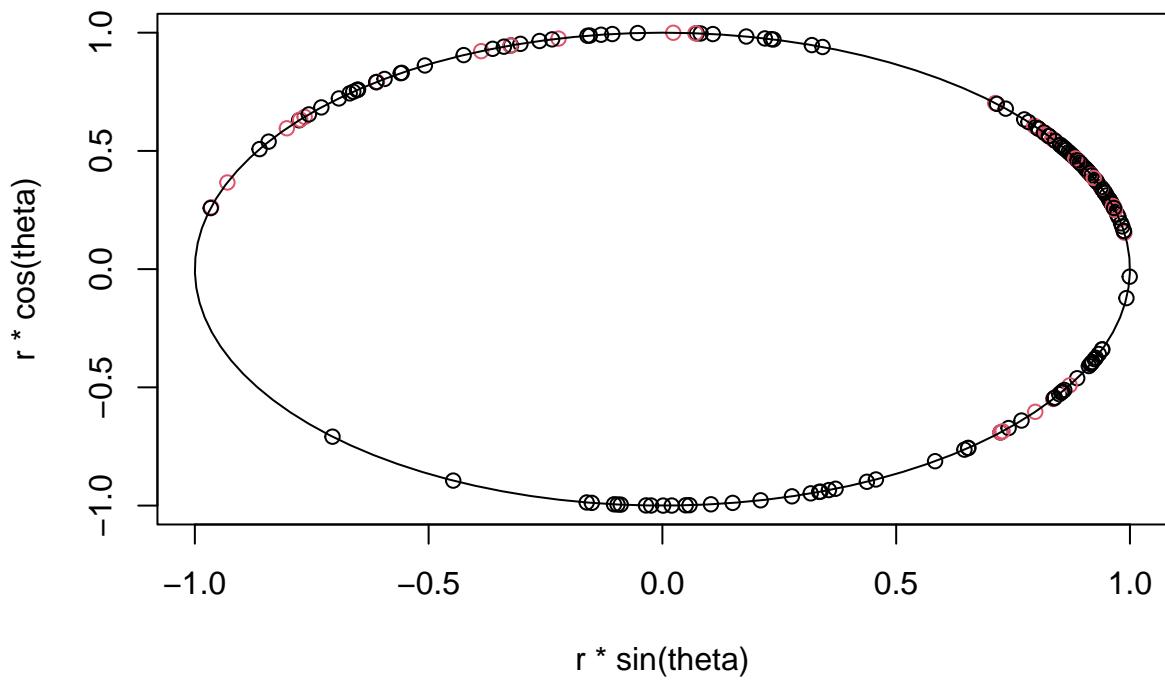
## [1] "Iteration 111"
## [1] "Iteration 112"
## [1] "Iteration 113"
## [1] "Iteration 114"

```

```
## [1] "Iteration 115"  
## [1] "Iteration 115: objective function value is 1.548799"
```

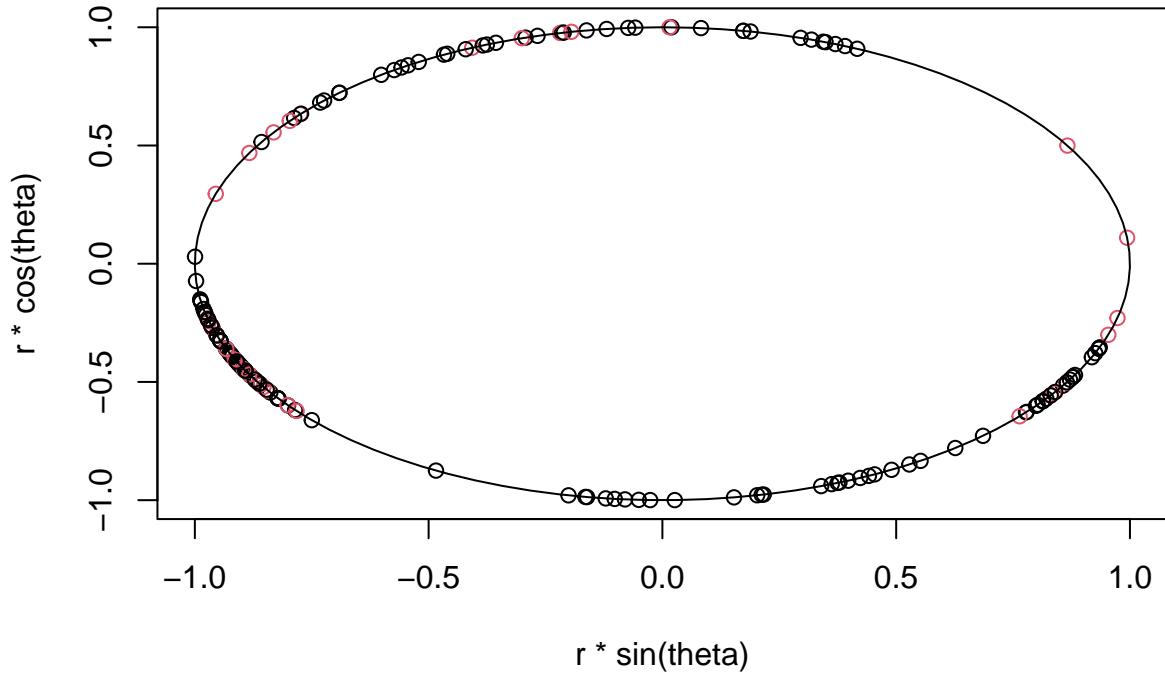


```
## [1] "Iteration 116"  
## [1] "Iteration 117"  
## [1] "Iteration 118"  
## [1] "Iteration 119"  
## [1] "Iteration 120"  
## [1] "Iteration 120: objective function value is 1.528753"
```

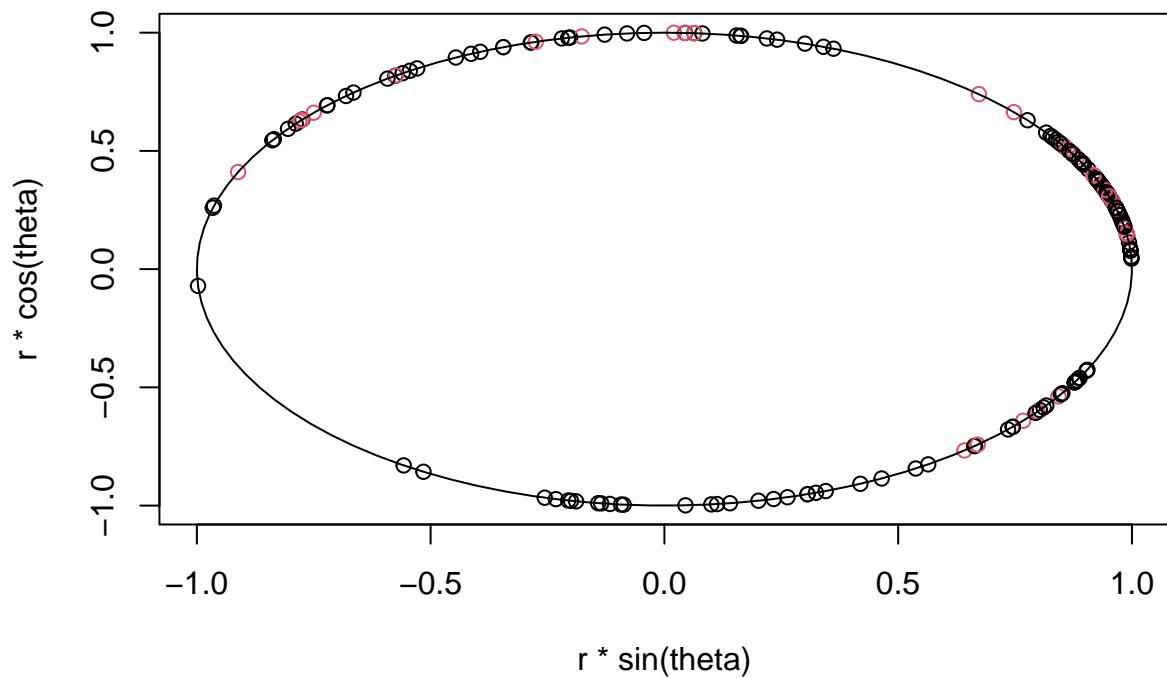


```
## [1] "Iteration 121"
```

```
## [1] "Iteration 122"  
## [1] "Iteration 123"  
## [1] "Iteration 124"  
## [1] "Iteration 125"  
## [1] "Iteration 125: objective function value is 1.559661"
```



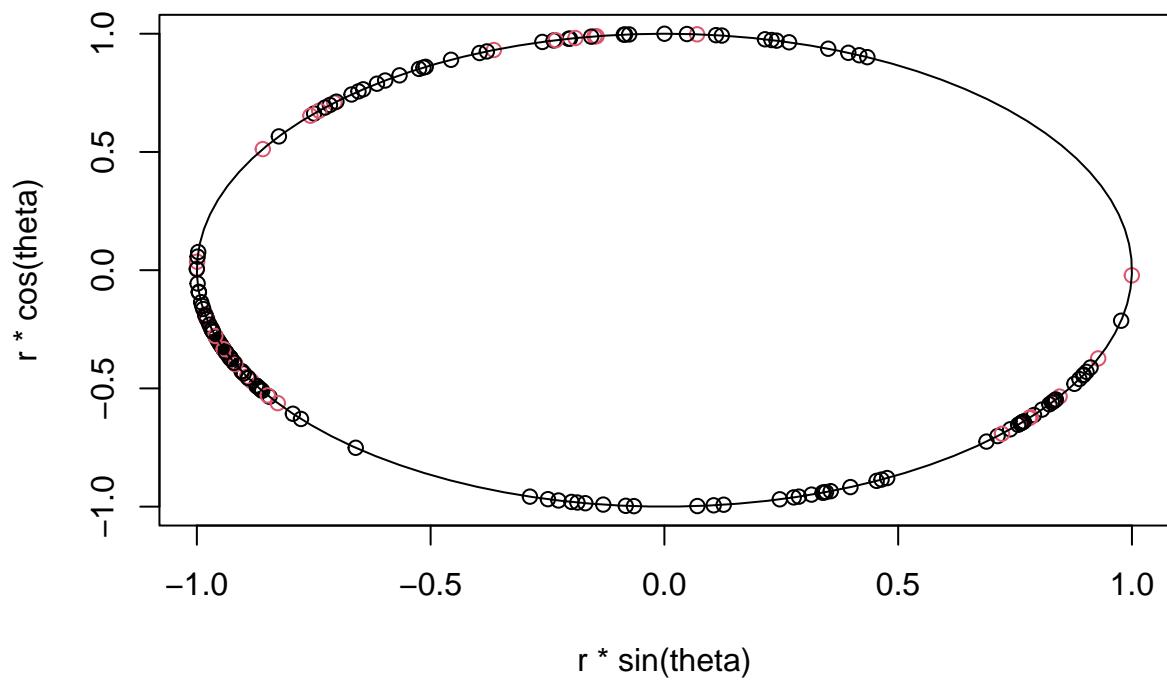
```
## [1] "Iteration 126"  
## [1] "Iteration 127"  
## [1] "Iteration 128"  
## [1] "Iteration 129"  
## [1] "Iteration 130"  
## [1] "Iteration 130: objective function value is 1.540042"
```



```

## [1] "Iteration 131"
## [1] "Iteration 132"
## [1] "Iteration 133"
## [1] "Iteration 134"
## [1] "Iteration 135"
## [1] "Iteration 135: objective function value is 1.552211"

```

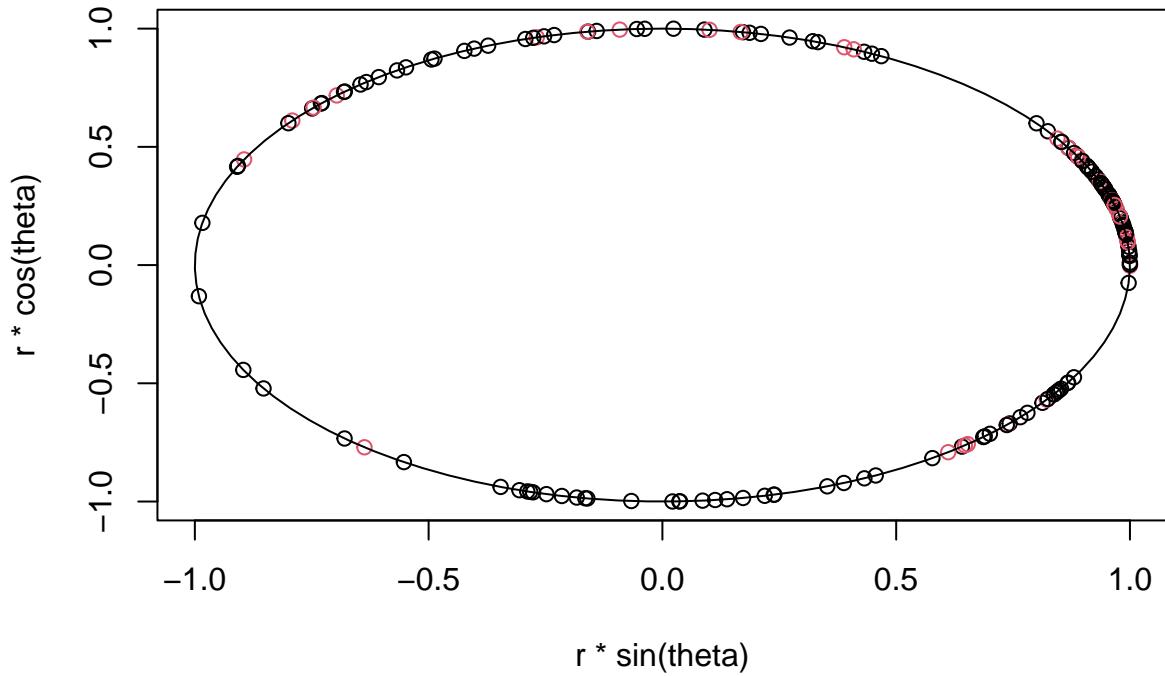


```

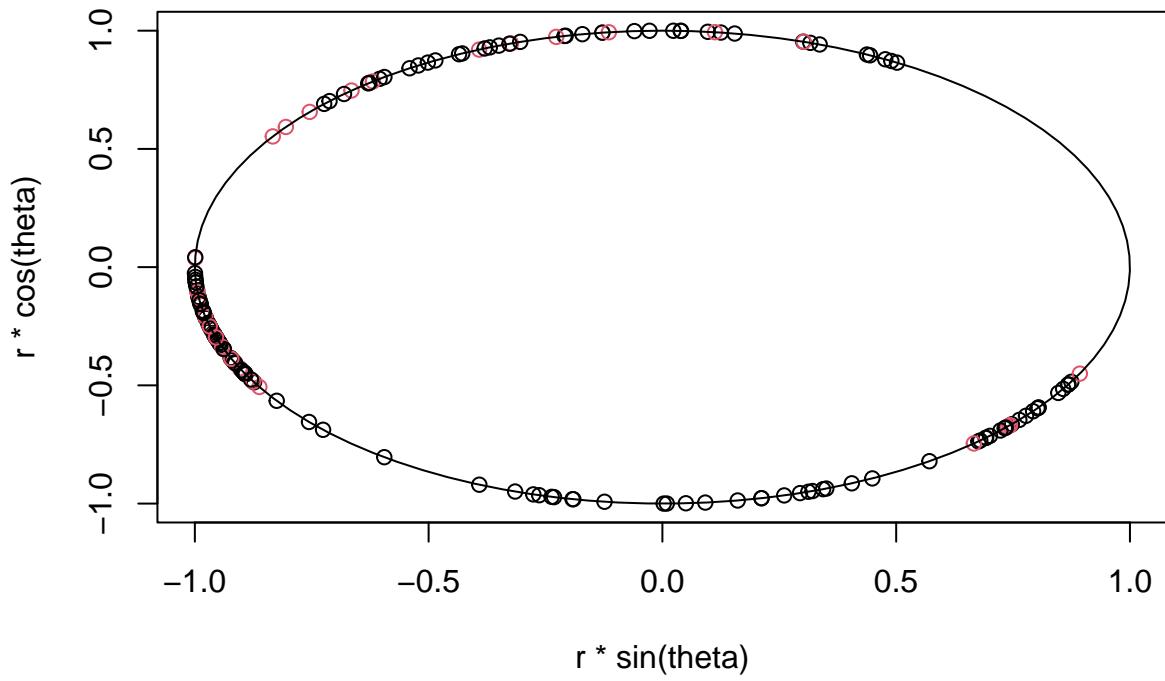
## [1] "Iteration 136"
## [1] "Iteration 137"
## [1] "Iteration 138"
## [1] "Iteration 139"

```

```
## [1] "Iteration 140"  
## [1] "Iteration 140: objective function value is 1.535419"
```

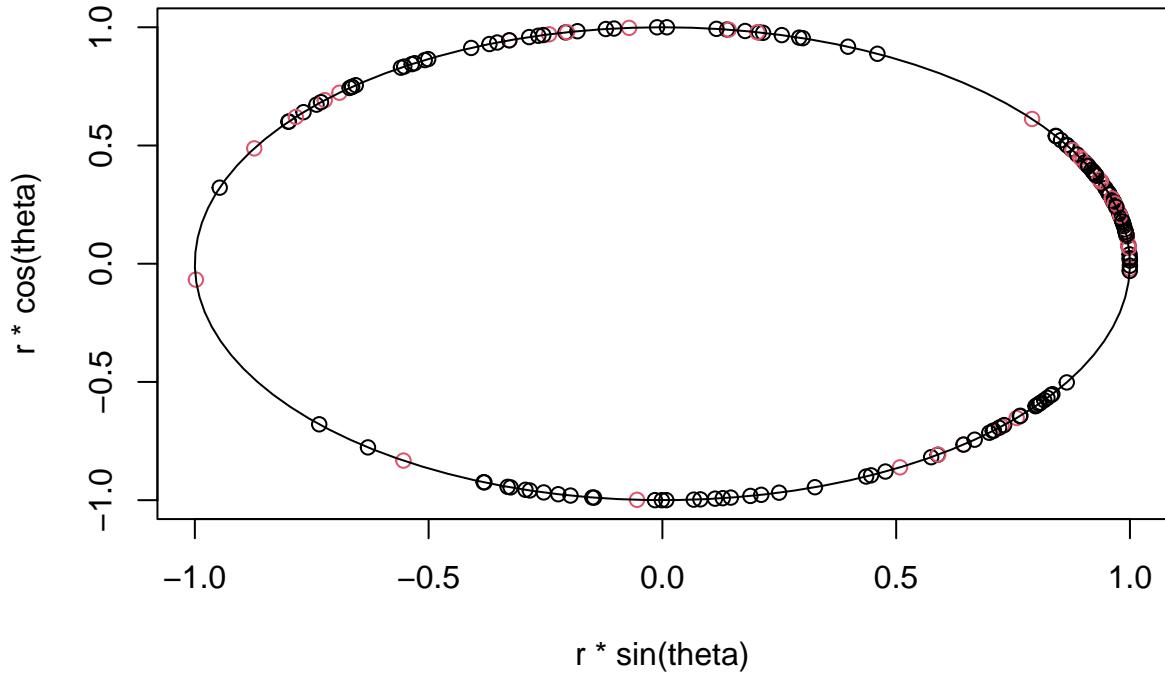


```
## [1] "Iteration 141"  
## [1] "Iteration 142"  
## [1] "Iteration 143"  
## [1] "Iteration 144"  
## [1] "Iteration 145"  
## [1] "Iteration 145: objective function value is 1.535423"
```

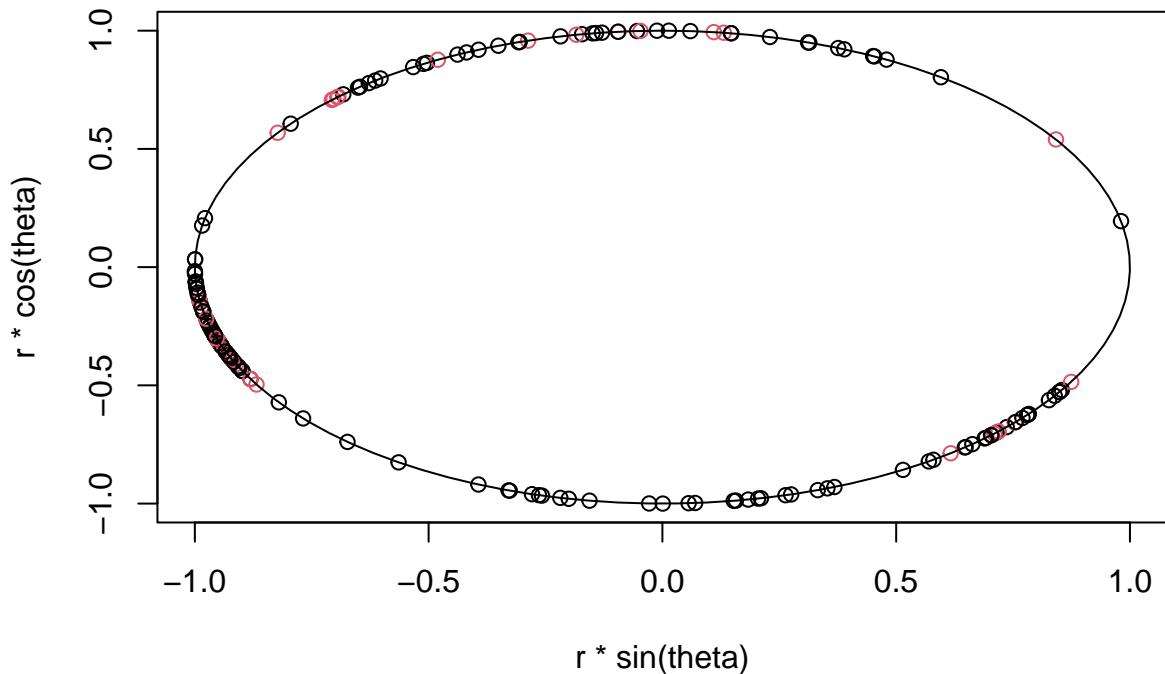


```
## [1] "Iteration 146"
```

```
## [1] "Iteration 147"  
## [1] "Iteration 148"  
## [1] "Iteration 149"  
## [1] "Iteration 150"  
## [1] "Iteration 150: objective function value is 1.544574"
```



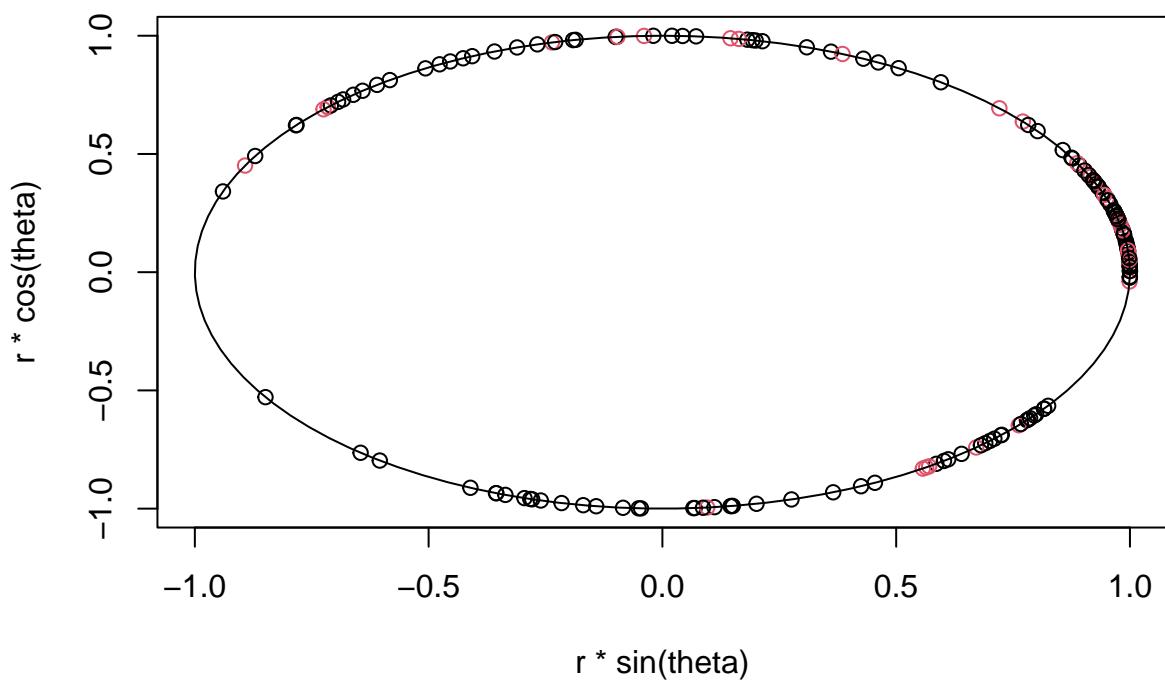
```
## [1] "Iteration 151"  
## [1] "Iteration 152"  
## [1] "Iteration 153"  
## [1] "Iteration 154"  
## [1] "Iteration 155"  
## [1] "Iteration 155: objective function value is 1.534950"
```



```

## [1] "Iteration 156"
## [1] "Iteration 157"
## [1] "Iteration 158"
## [1] "Iteration 159"
## [1] "Iteration 160"
## [1] "Iteration 160: objective function value is 1.533823"

```

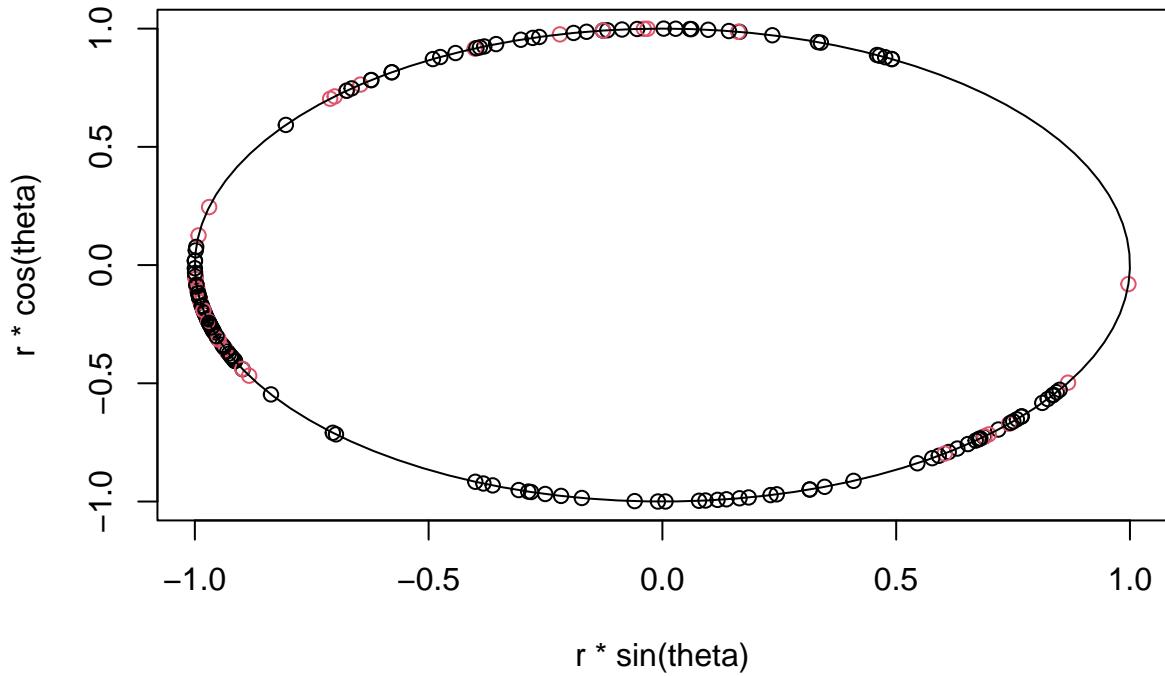


```

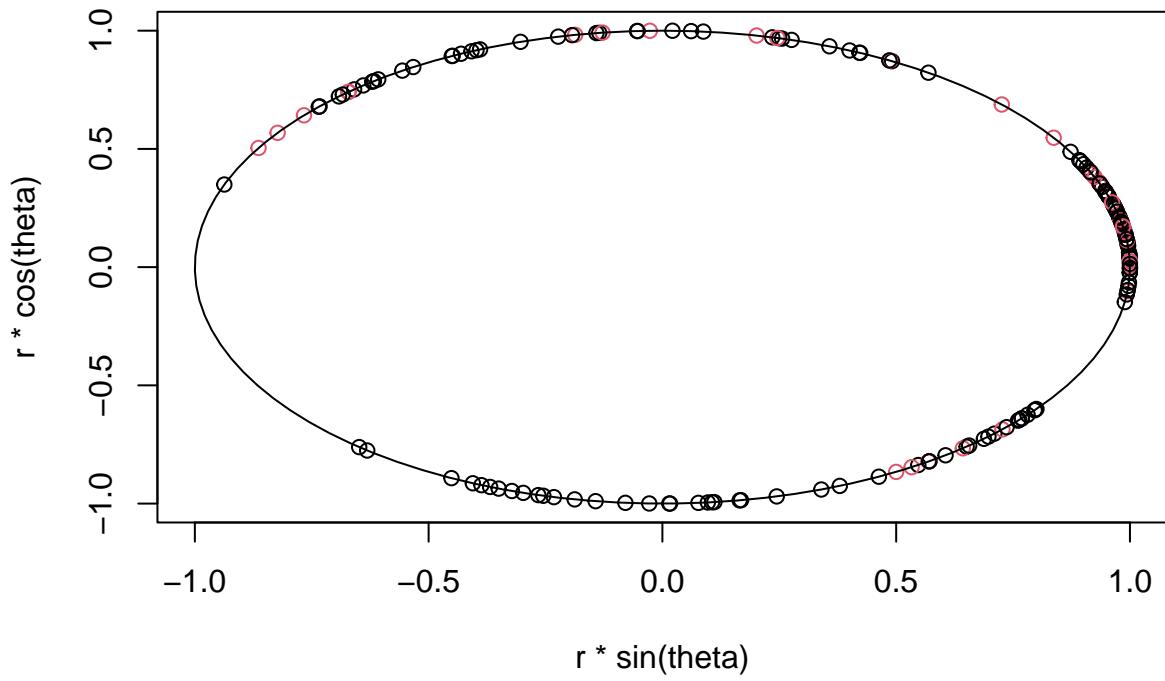
## [1] "Iteration 161"
## [1] "Iteration 162"
## [1] "Iteration 163"
## [1] "Iteration 164"

```

```
## [1] "Iteration 165"  
## [1] "Iteration 165: objective function value is 1.554295"
```



```
## [1] "Iteration 166"  
## [1] "Iteration 167"  
## [1] "Iteration 168"  
## [1] "Iteration 169"  
## [1] "Iteration 170"  
## [1] "Iteration 170: objective function value is 1.514965"
```

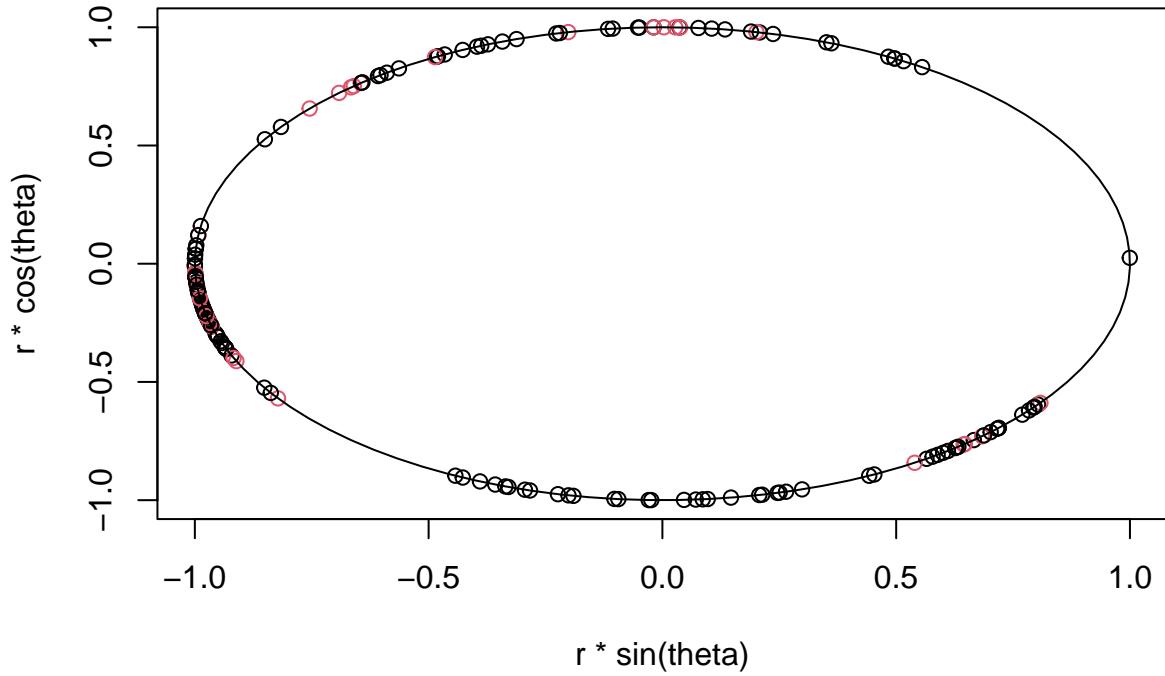


```
## [1] "Iteration 171"
```

```

## [1] "Iteration 172"
## [1] "Iteration 173"
## [1] "Iteration 174"
## [1] "Iteration 175"
## [1] "Iteration 175: objective function value is 1.526130"

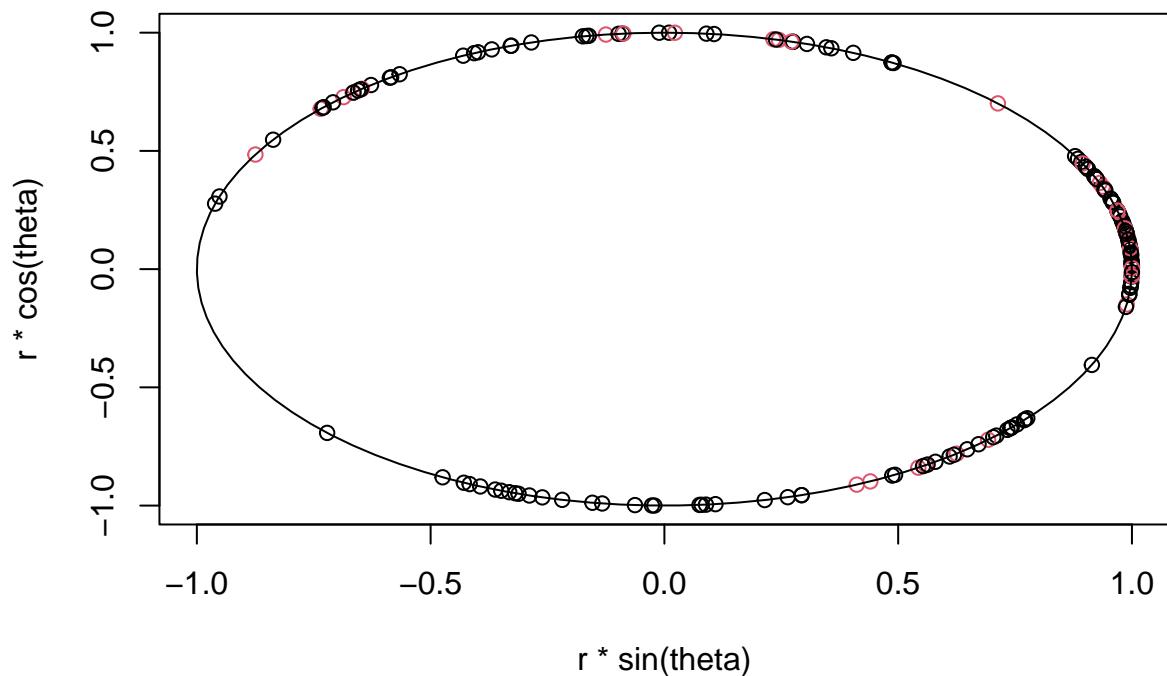
```



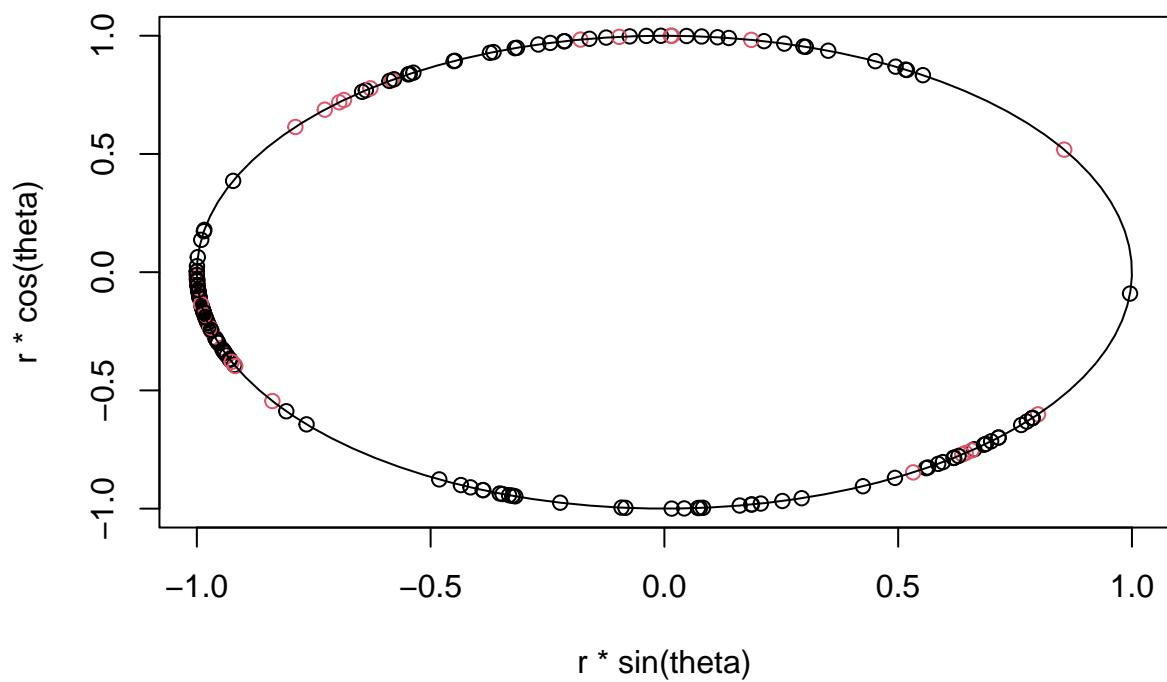
```

## [1] "Iteration 176"
## [1] "Iteration 177"
## [1] "Iteration 178"
## [1] "Iteration 179"
## [1] "Iteration 180"
## [1] "Iteration 180: objective function value is 1.541452"

```

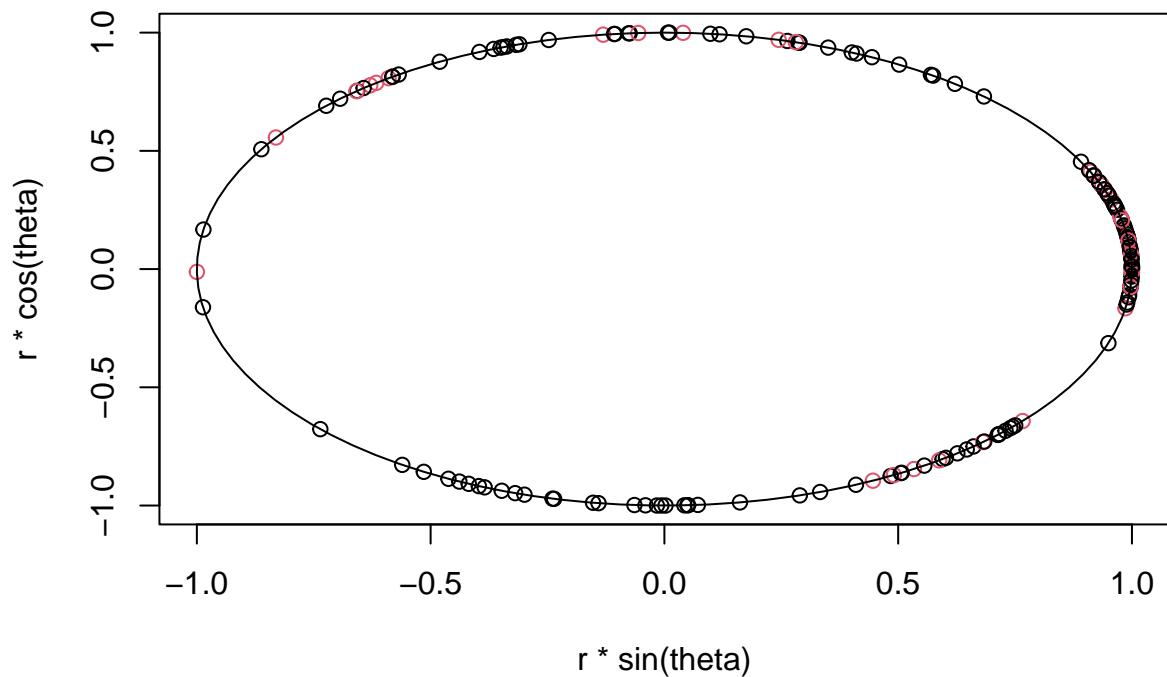


```
## [1] "Iteration 181"
## [1] "Iteration 182"
## [1] "Iteration 183"
## [1] "Iteration 184"
## [1] "Iteration 185"
## [1] "Iteration 185: objective function value is 1.528466"
```

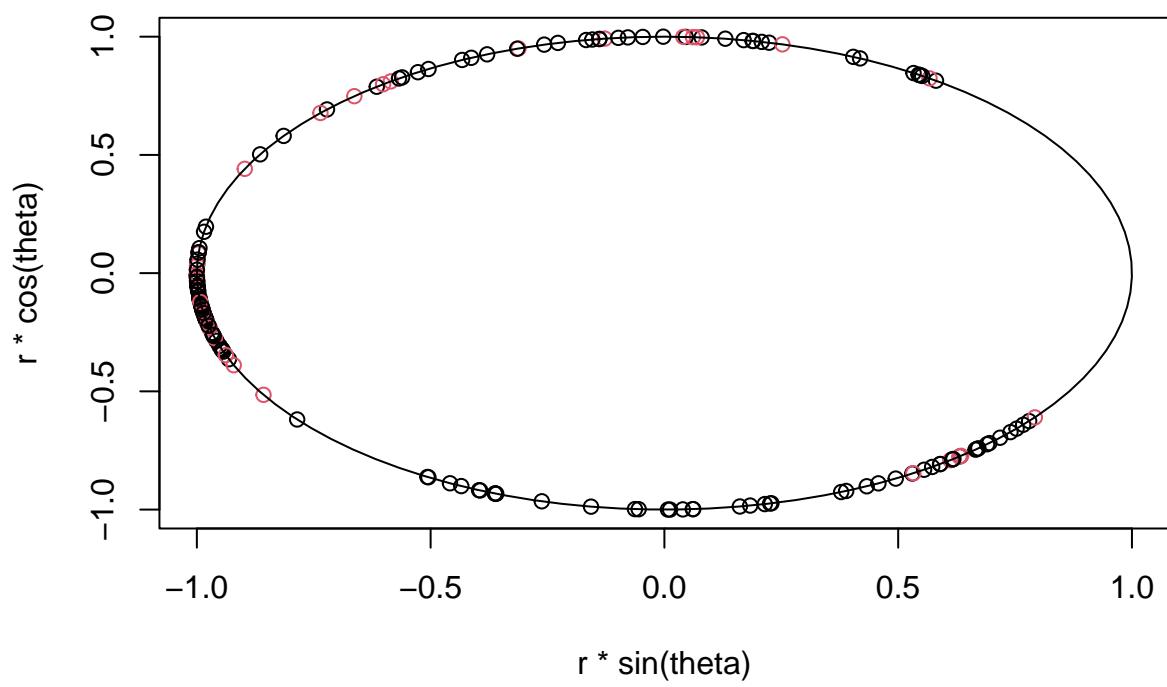


```
## [1] "Iteration 186"
## [1] "Iteration 187"
## [1] "Iteration 188"
## [1] "Iteration 189"
```

```
## [1] "Iteration 190"  
## [1] "Iteration 190: objective function value is 1.528957"
```

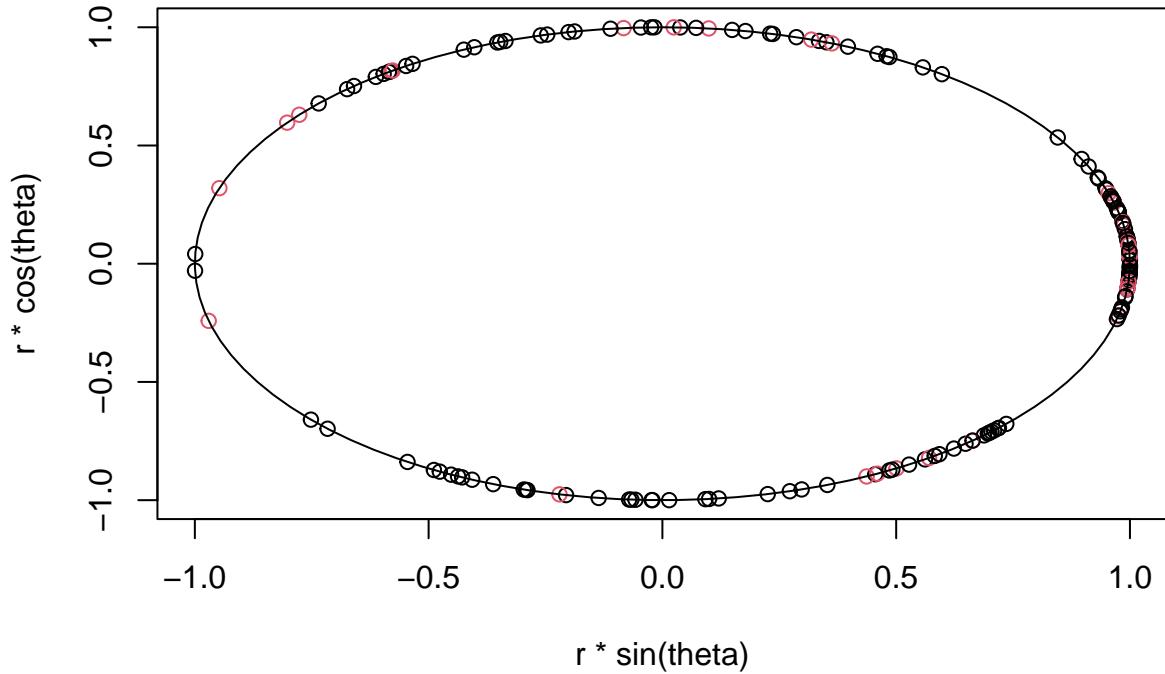


```
## [1] "Iteration 191"  
## [1] "Iteration 192"  
## [1] "Iteration 193"  
## [1] "Iteration 194"  
## [1] "Iteration 195"  
## [1] "Iteration 195: objective function value is 1.527166"
```

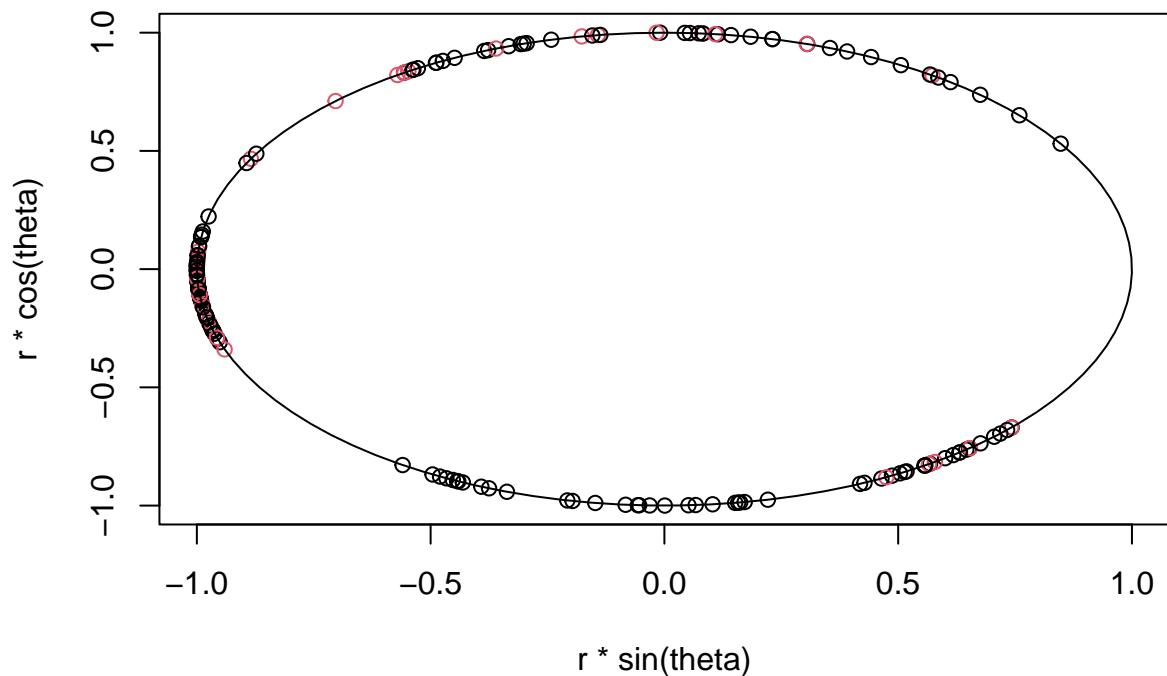


```
## [1] "Iteration 196"
```

```
## [1] "Iteration 197"  
## [1] "Iteration 198"  
## [1] "Iteration 199"  
## [1] "Iteration 200"  
## [1] "Iteration 200: objective function value is 1.533250"
```



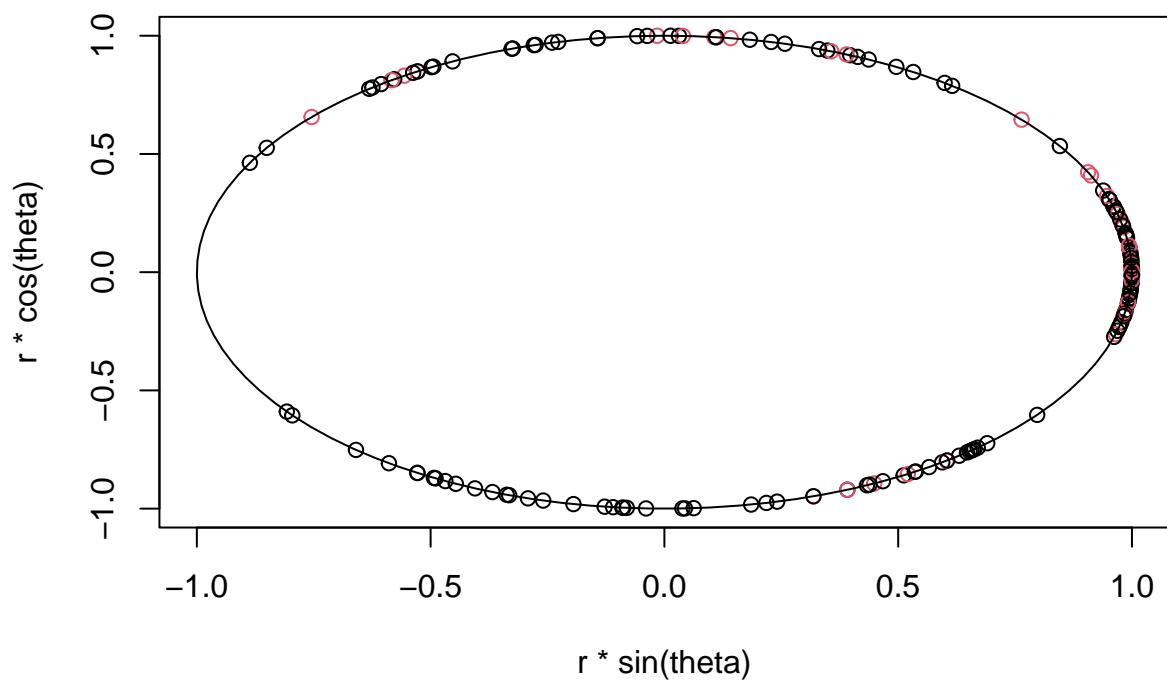
```
## [1] "Iteration 201"  
## [1] "Iteration 202"  
## [1] "Iteration 203"  
## [1] "Iteration 204"  
## [1] "Iteration 205"  
## [1] "Iteration 205: objective function value is 1.526461"
```



```

## [1] "Iteration 206"
## [1] "Iteration 207"
## [1] "Iteration 208"
## [1] "Iteration 209"
## [1] "Iteration 210"
## [1] "Iteration 210: objective function value is 1.512849"

```

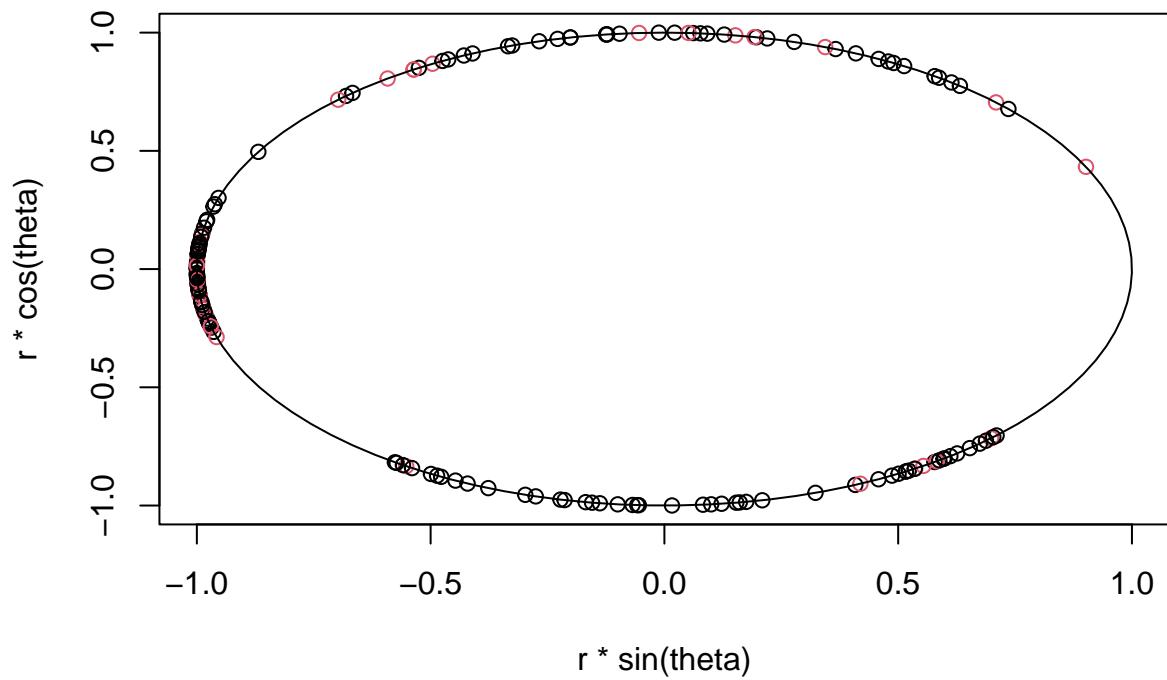


```

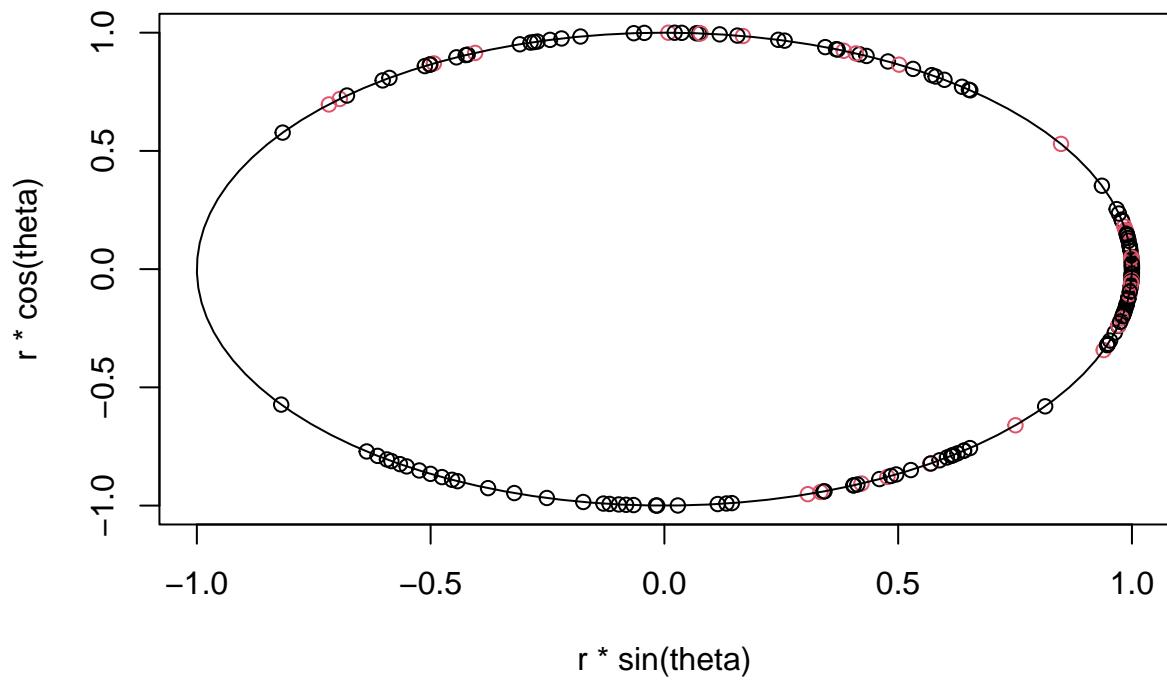
## [1] "Iteration 211"
## [1] "Iteration 212"
## [1] "Iteration 213"
## [1] "Iteration 214"

```

```
## [1] "Iteration 215"  
## [1] "Iteration 215: objective function value is 1.523161"
```

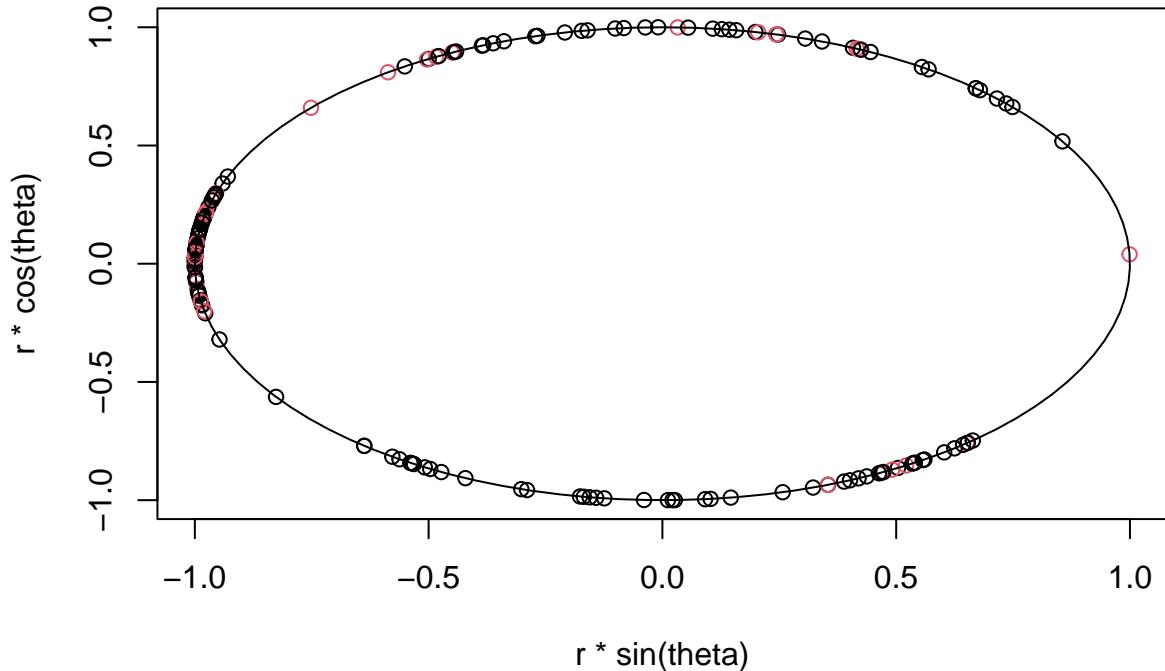


```
## [1] "Iteration 216"  
## [1] "Iteration 217"  
## [1] "Iteration 218"  
## [1] "Iteration 219"  
## [1] "Iteration 220"  
## [1] "Iteration 220: objective function value is 1.516327"
```

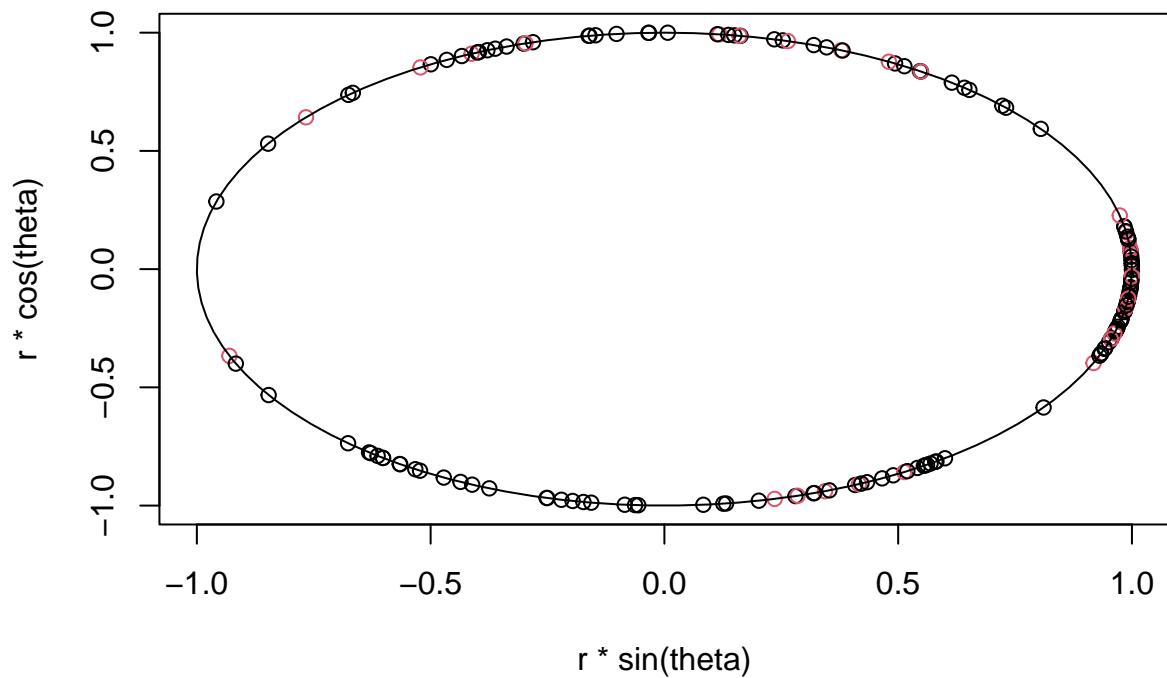


```
## [1] "Iteration 221"
```

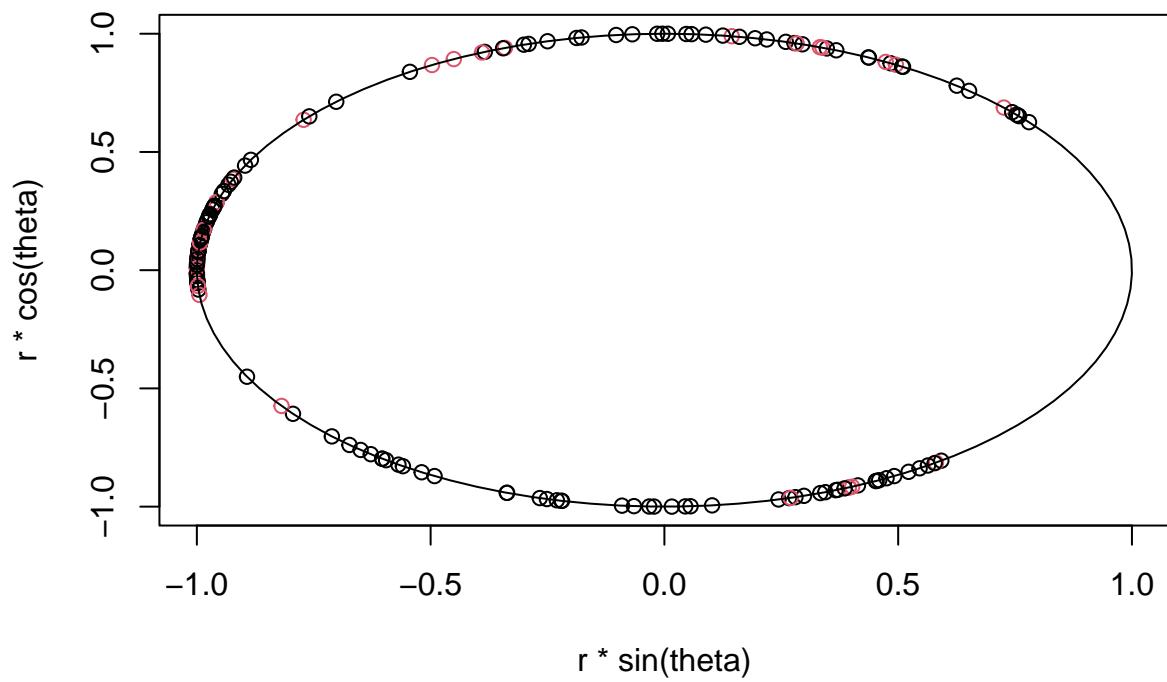
```
## [1] "Iteration 222"  
## [1] "Iteration 223"  
## [1] "Iteration 224"  
## [1] "Iteration 225"  
## [1] "Iteration 225: objective function value is 1.516326"
```



```
## [1] "Iteration 226"  
## [1] "Iteration 227"  
## [1] "Iteration 228"  
## [1] "Iteration 229"  
## [1] "Iteration 230"  
## [1] "Iteration 230: objective function value is 1.522143"
```

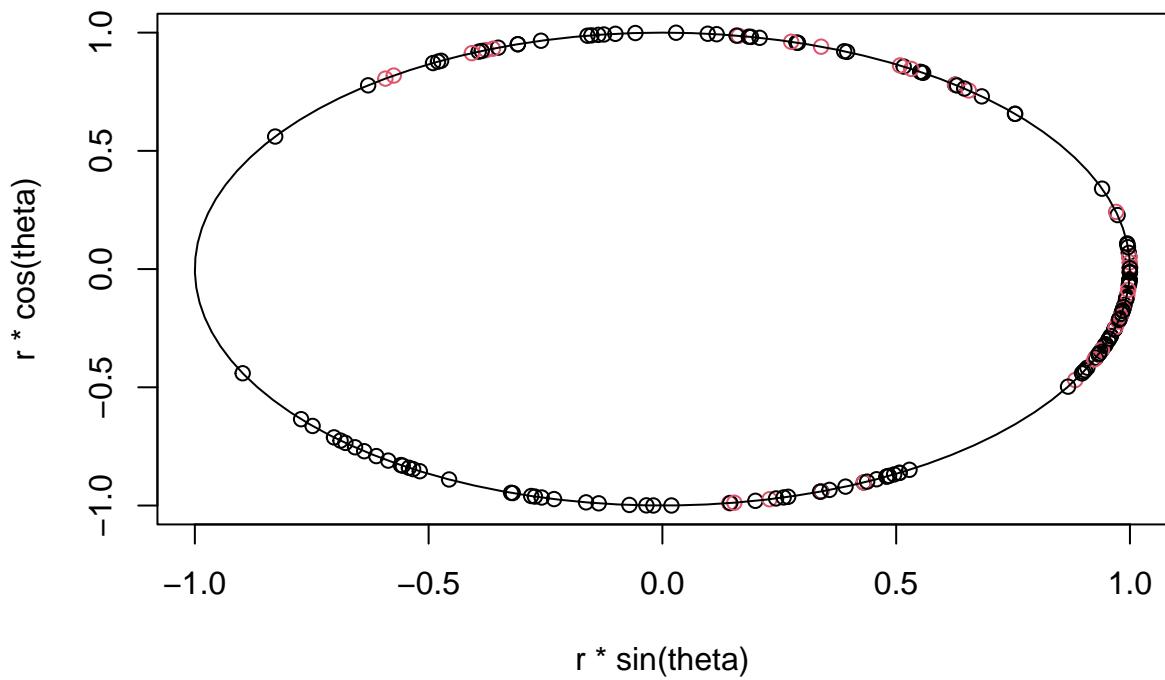


```
## [1] "Iteration 231"
## [1] "Iteration 232"
## [1] "Iteration 233"
## [1] "Iteration 234"
## [1] "Iteration 235"
## [1] "Iteration 235: objective function value is 1.533666"
```

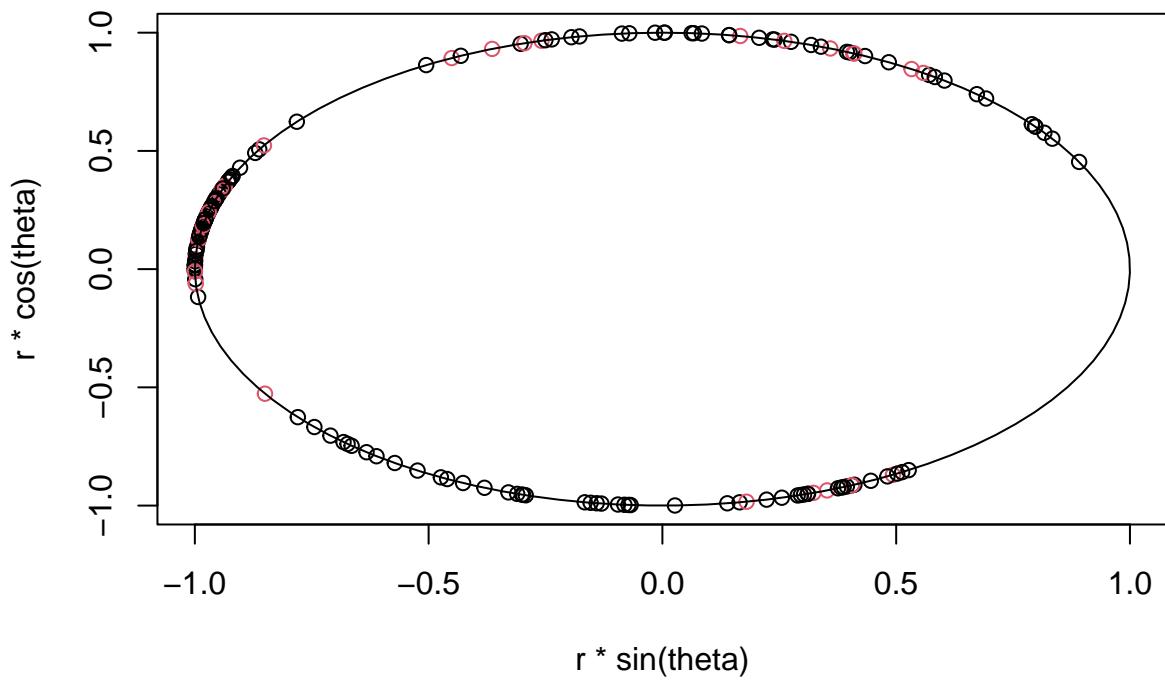


```
## [1] "Iteration 236"
## [1] "Iteration 237"
## [1] "Iteration 238"
## [1] "Iteration 239"
```

```
## [1] "Iteration 240"  
## [1] "Iteration 240: objective function value is 1.527559"
```

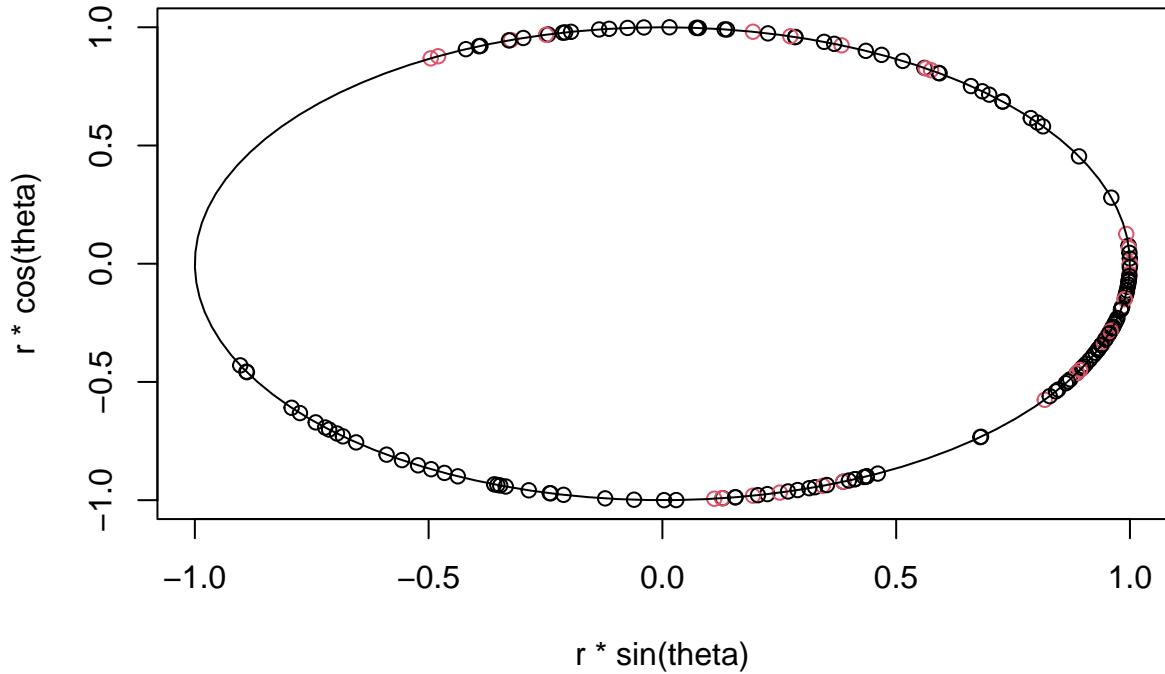


```
## [1] "Iteration 241"  
## [1] "Iteration 242"  
## [1] "Iteration 243"  
## [1] "Iteration 244"  
## [1] "Iteration 245"  
## [1] "Iteration 245: objective function value is 1.532270"
```

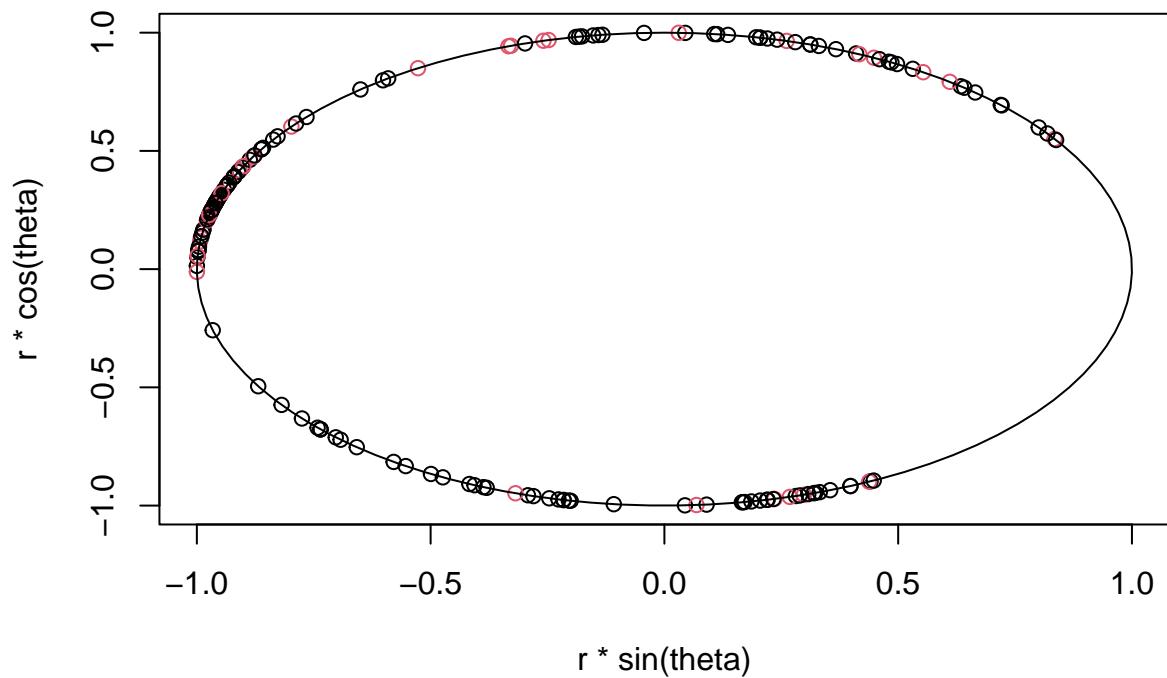


```
## [1] "Iteration 246"
```

```
## [1] "Iteration 247"  
## [1] "Iteration 248"  
## [1] "Iteration 249"  
## [1] "Iteration 250"  
## [1] "Iteration 250: objective function value is 1.501968"
```



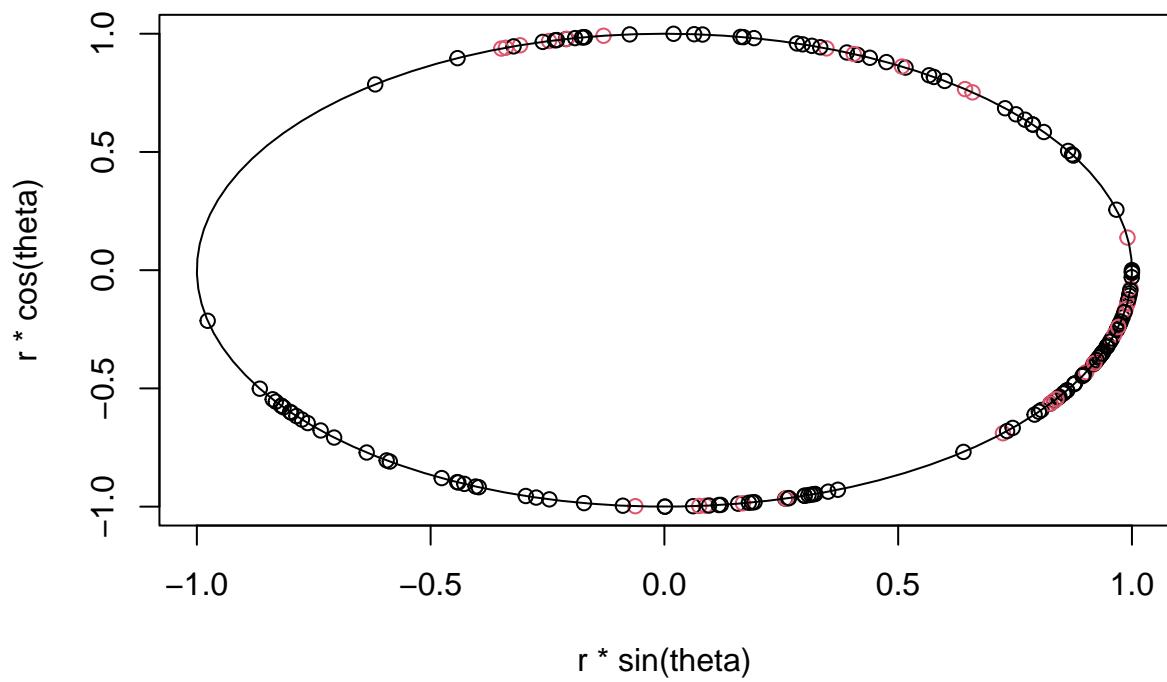
```
## [1] "Iteration 251"  
## [1] "Iteration 252"  
## [1] "Iteration 253"  
## [1] "Iteration 254"  
## [1] "Iteration 255"  
## [1] "Iteration 255: objective function value is 1.503213"
```



```

## [1] "Iteration 256"
## [1] "Iteration 257"
## [1] "Iteration 258"
## [1] "Iteration 259"
## [1] "Iteration 260"
## [1] "Iteration 260: objective function value is 1.486079"

```

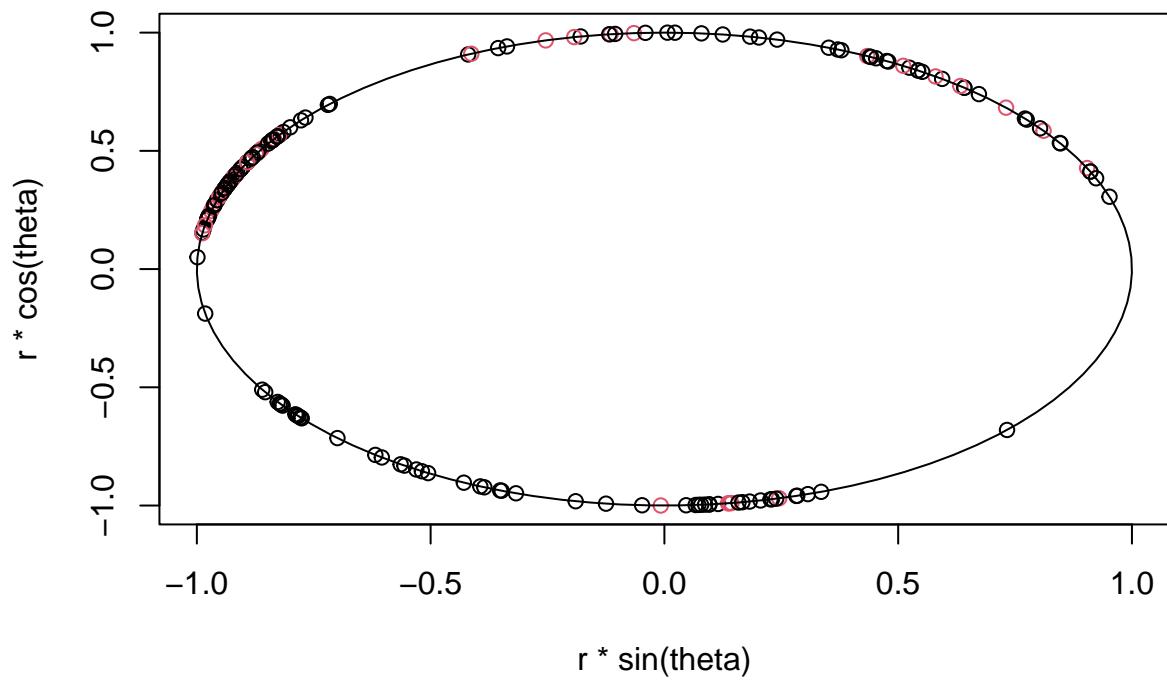


```

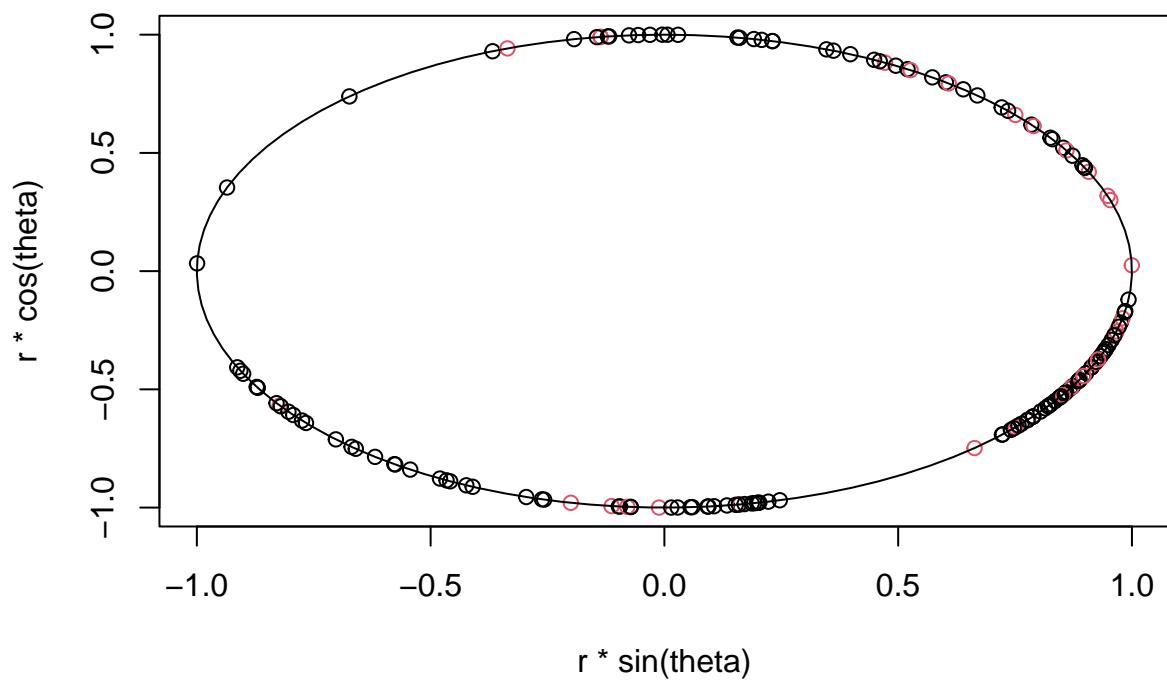
## [1] "Iteration 261"
## [1] "Iteration 262"
## [1] "Iteration 263"
## [1] "Iteration 264"

```

```
## [1] "Iteration 265"  
## [1] "Iteration 265: objective function value is 1.514536"
```

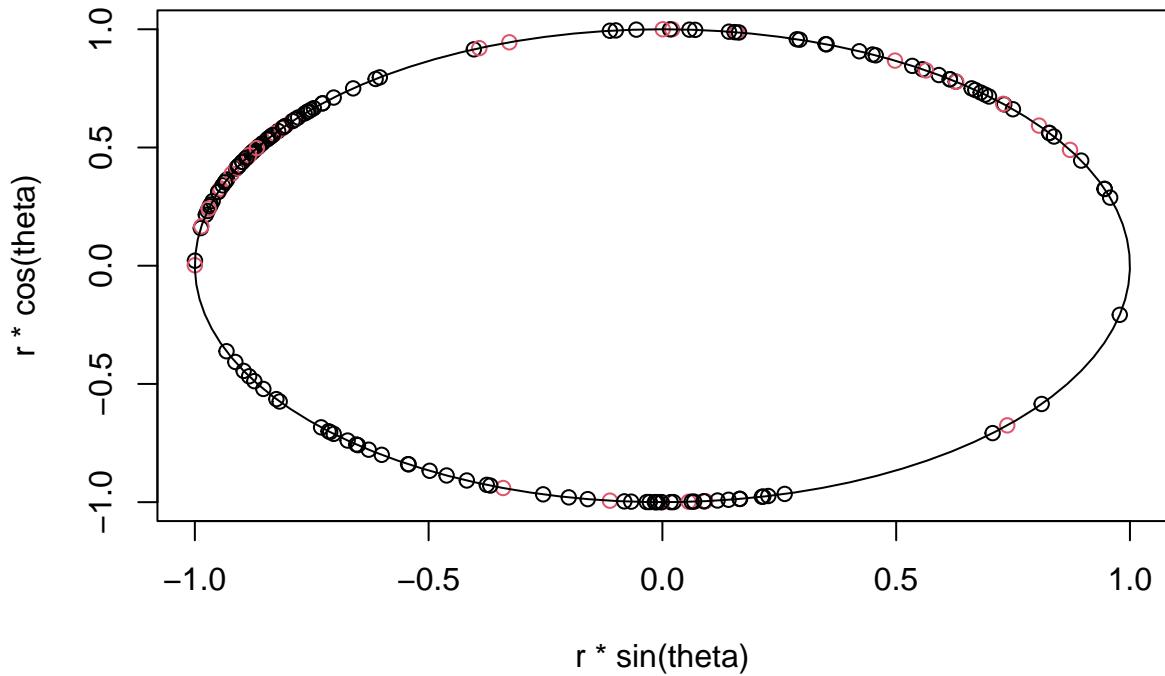


```
## [1] "Iteration 266"  
## [1] "Iteration 267"  
## [1] "Iteration 268"  
## [1] "Iteration 269"  
## [1] "Iteration 270"  
## [1] "Iteration 270: objective function value is 1.496824"
```

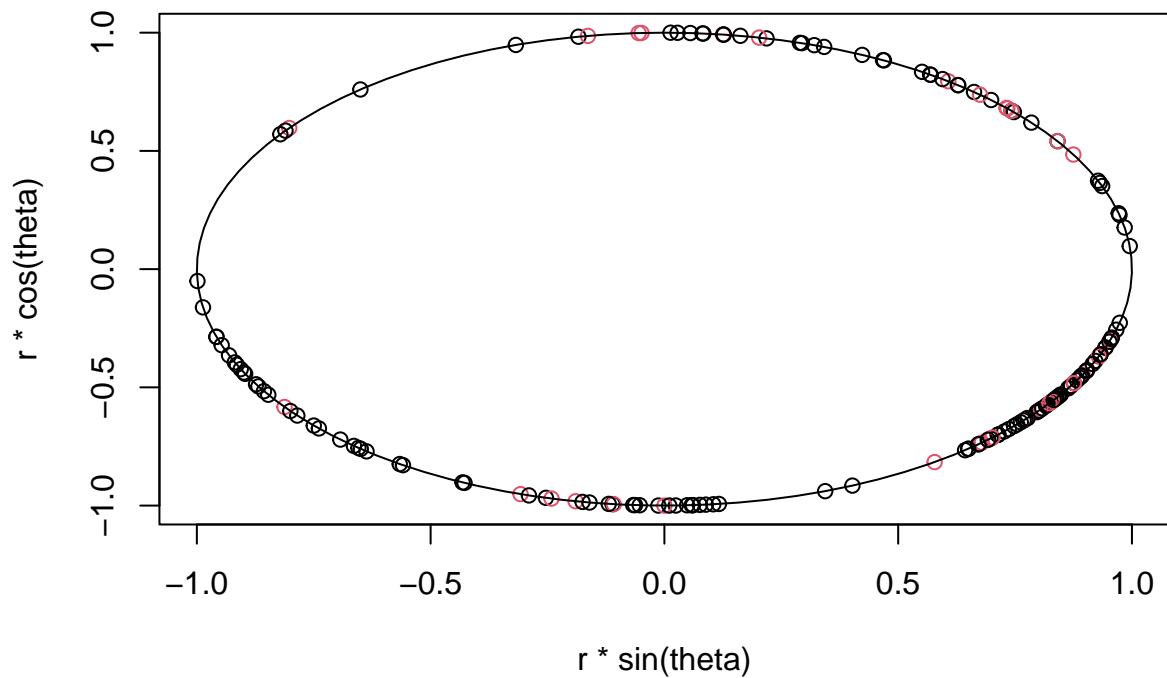


```
## [1] "Iteration 271"
```

```
## [1] "Iteration 272"  
## [1] "Iteration 273"  
## [1] "Iteration 274"  
## [1] "Iteration 275"  
## [1] "Iteration 275: objective function value is 1.511972"
```



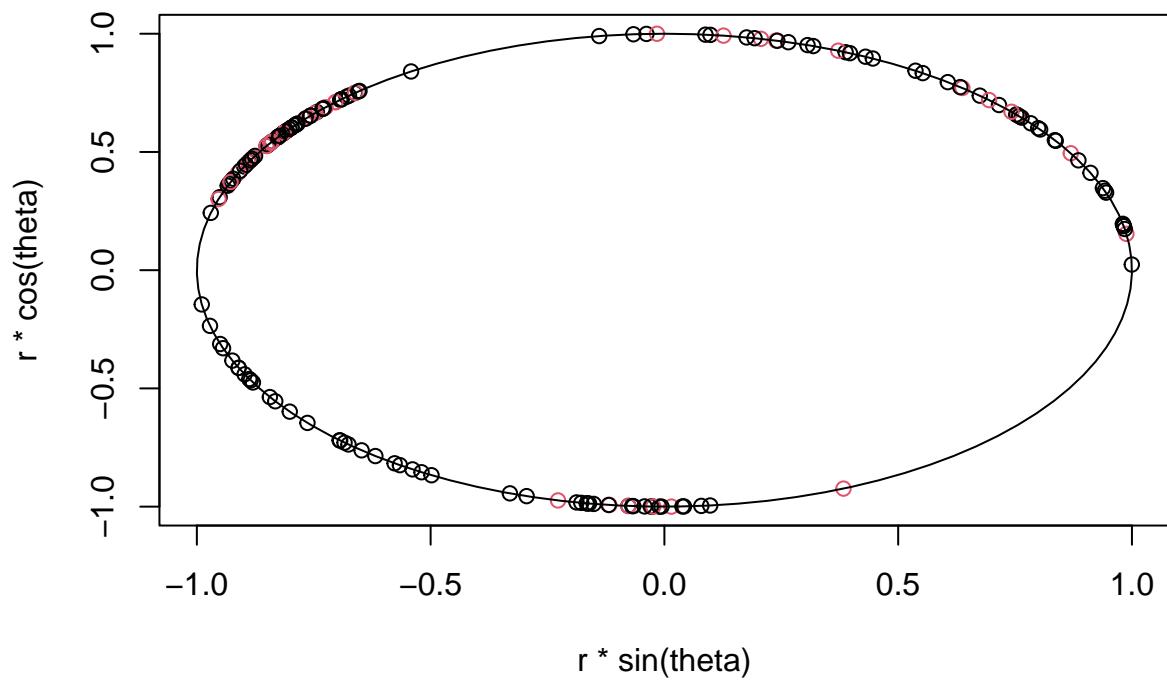
```
## [1] "Iteration 276"  
## [1] "Iteration 277"  
## [1] "Iteration 278"  
## [1] "Iteration 279"  
## [1] "Iteration 280"  
## [1] "Iteration 280: objective function value is 1.516284"
```



```

## [1] "Iteration 281"
## [1] "Iteration 282"
## [1] "Iteration 283"
## [1] "Iteration 284"
## [1] "Iteration 285"
## [1] "Iteration 285: objective function value is 1.509304"

```

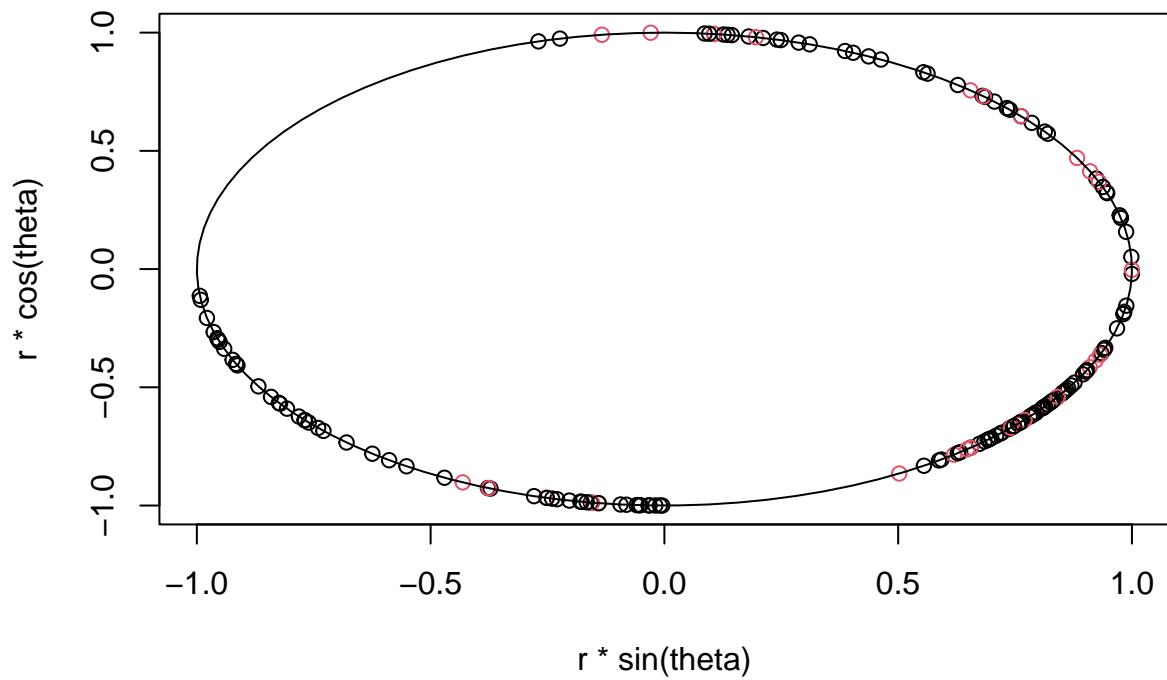


```

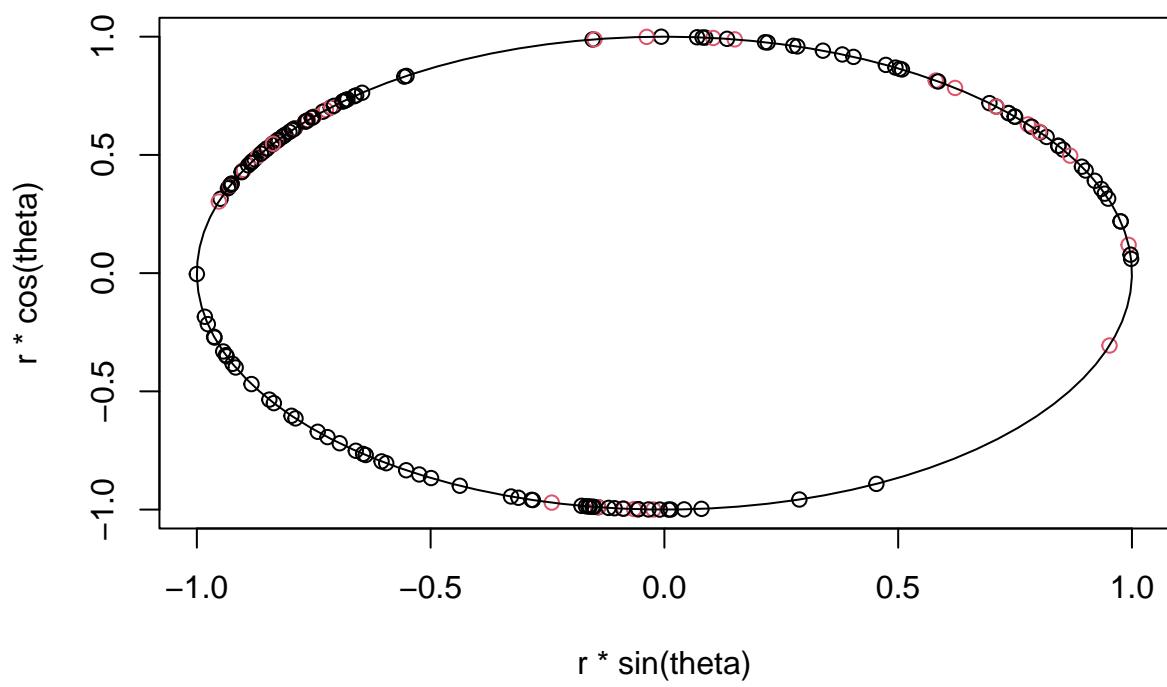
## [1] "Iteration 286"
## [1] "Iteration 287"
## [1] "Iteration 288"
## [1] "Iteration 289"

```

```
## [1] "Iteration 290"  
## [1] "Iteration 290: objective function value is 1.465490"
```

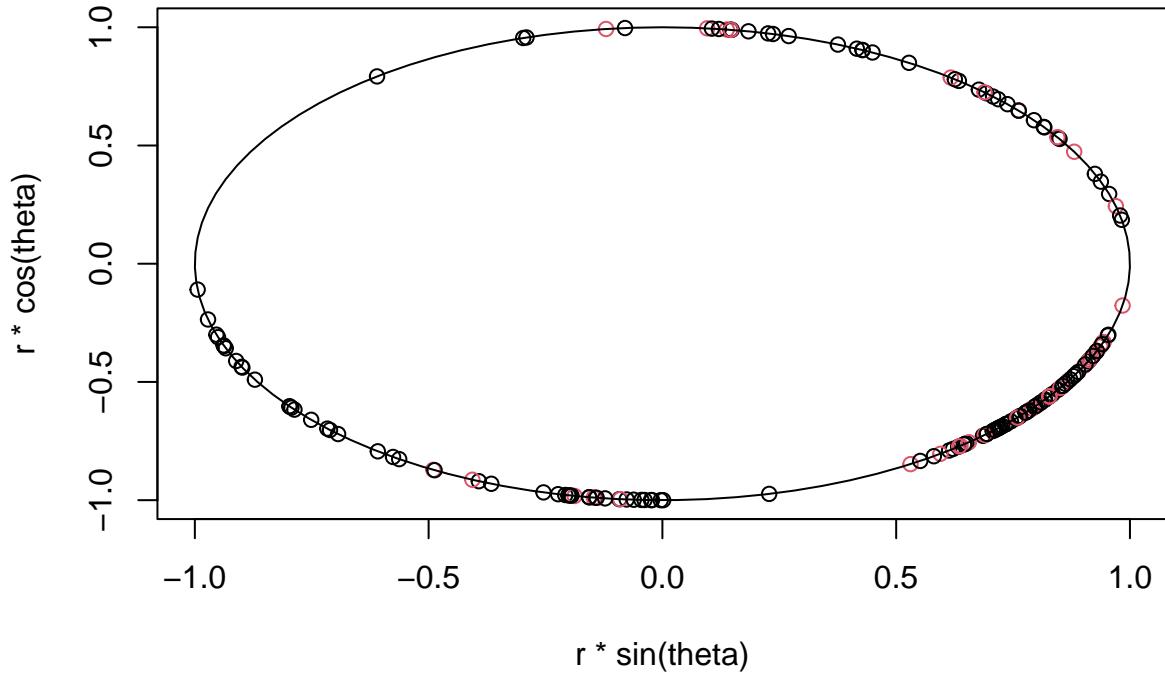


```
## [1] "Iteration 291"  
## [1] "Iteration 292"  
## [1] "Iteration 293"  
## [1] "Iteration 294"  
## [1] "Iteration 295"  
## [1] "Iteration 295: objective function value is 1.487979"
```

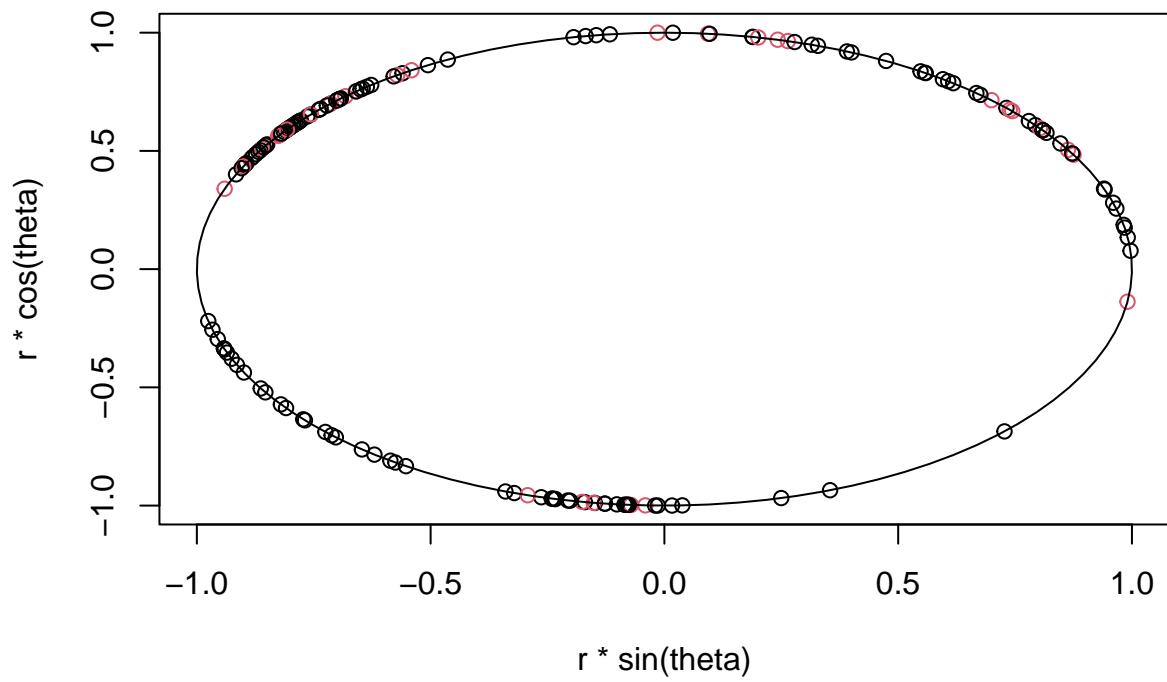


```
## [1] "Iteration 296"
```

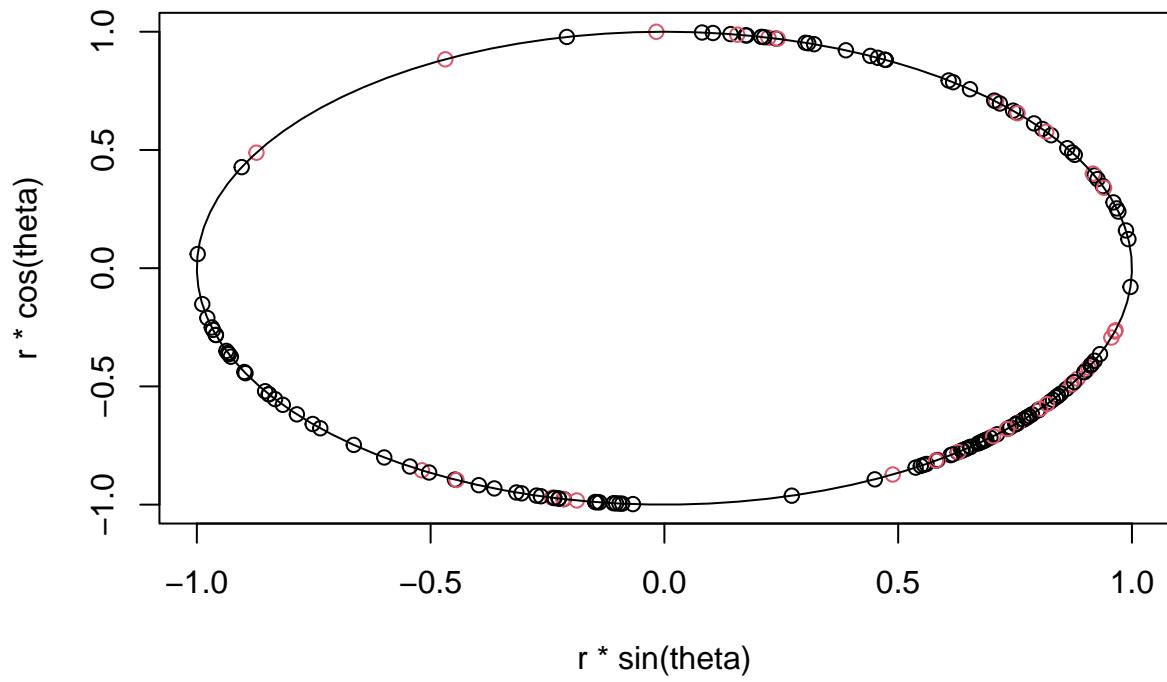
```
## [1] "Iteration 297"  
## [1] "Iteration 298"  
## [1] "Iteration 299"  
## [1] "Iteration 300"  
## [1] "Iteration 300: objective function value is 1.515748"
```



```
## [1] "Iteration 301"  
## [1] "Iteration 302"  
## [1] "Iteration 303"  
## [1] "Iteration 304"  
## [1] "Iteration 305"  
## [1] "Iteration 305: objective function value is 1.506911"
```

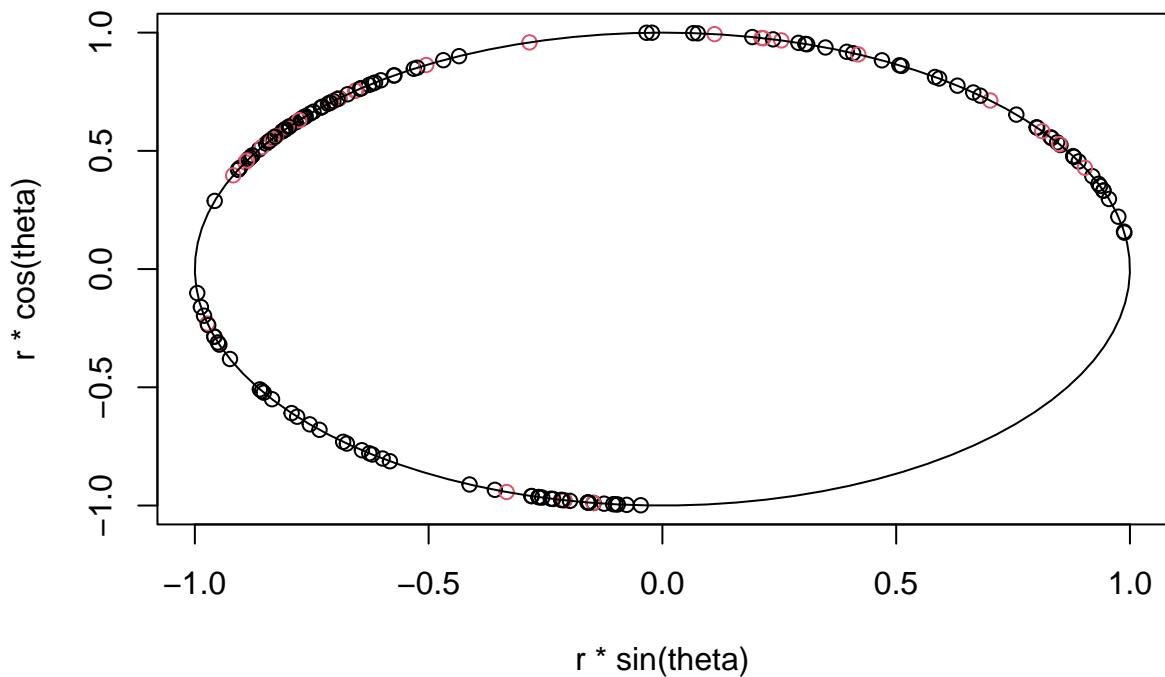


```
## [1] "Iteration 306"
## [1] "Iteration 307"
## [1] "Iteration 308"
## [1] "Iteration 309"
## [1] "Iteration 310"
## [1] "Iteration 310: objective function value is 1.518876"
```

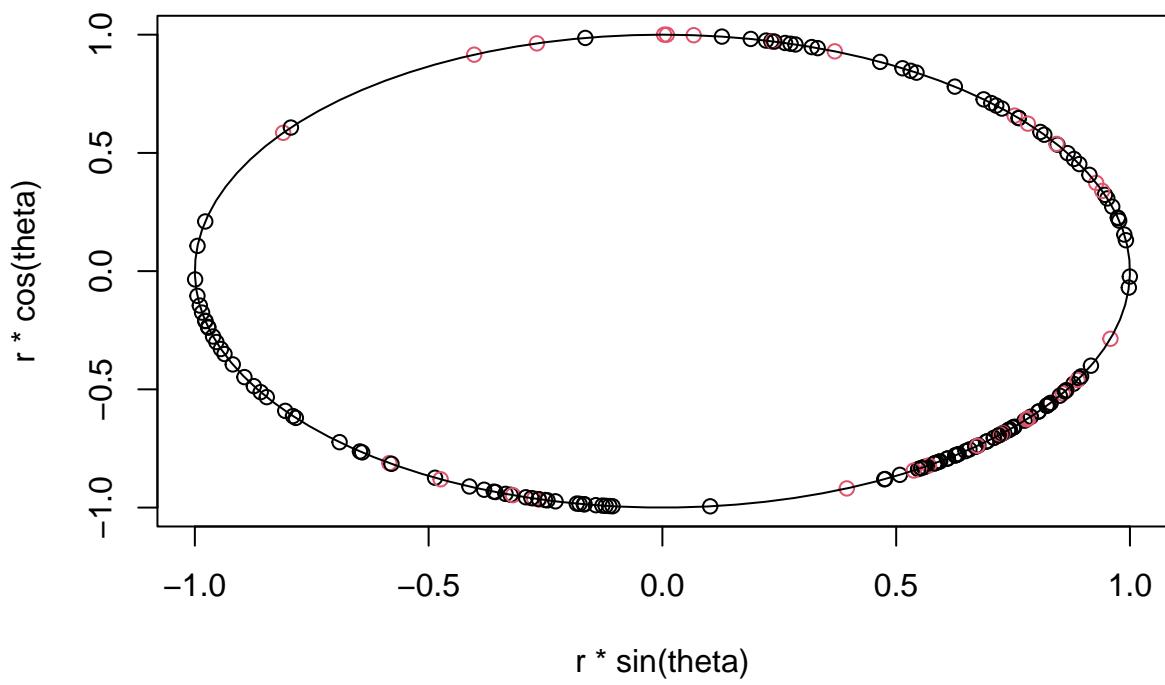


```
## [1] "Iteration 311"
## [1] "Iteration 312"
## [1] "Iteration 313"
## [1] "Iteration 314"
```

```
## [1] "Iteration 315"  
## [1] "Iteration 315: objective function value is 1.515744"
```



```
## [1] "Iteration 316"  
## [1] "Iteration 317"  
## [1] "Iteration 318"  
## [1] "Iteration 319"  
## [1] "Iteration 320"  
## [1] "Iteration 320: objective function value is 1.513358"
```

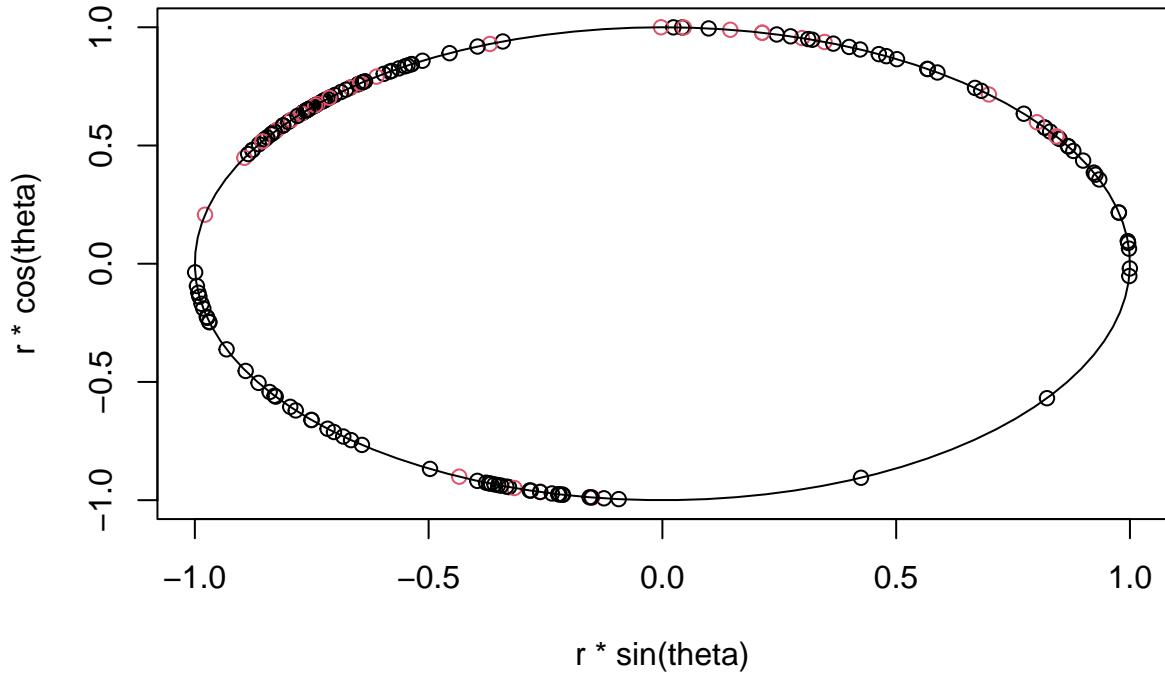


```
## [1] "Iteration 321"
```

```

## [1] "Iteration 322"
## [1] "Iteration 323"
## [1] "Iteration 324"
## [1] "Iteration 325"
## [1] "Iteration 325: objective function value is 1.503994"

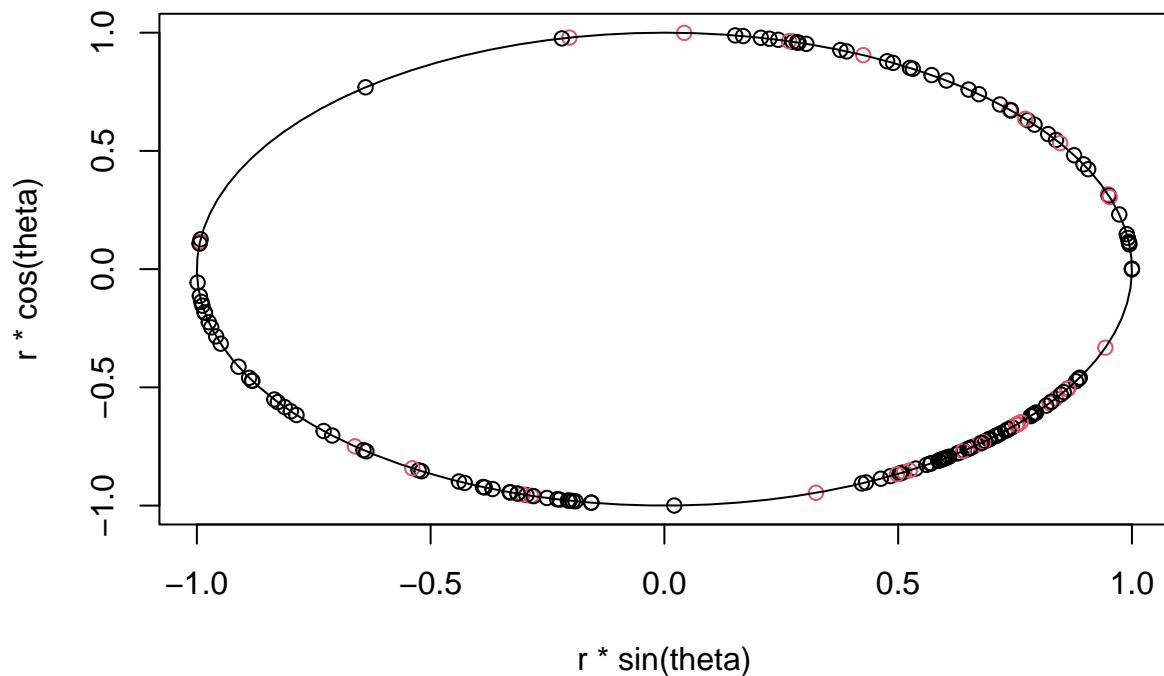
```



```

## [1] "Iteration 326"
## [1] "Iteration 327"
## [1] "Iteration 328"
## [1] "Iteration 329"
## [1] "Iteration 330"
## [1] "Iteration 330: objective function value is 1.512070"

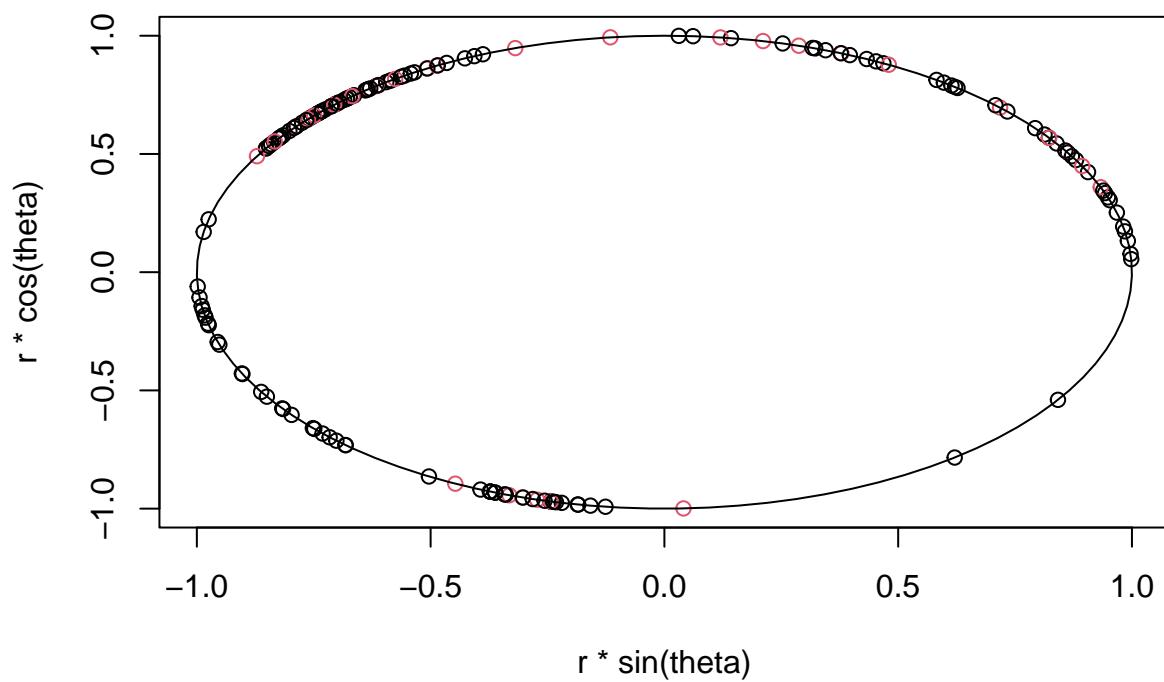
```



```

## [1] "Iteration 331"
## [1] "Iteration 332"
## [1] "Iteration 333"
## [1] "Iteration 334"
## [1] "Iteration 335"
## [1] "Iteration 335: objective function value is 1.514492"

```

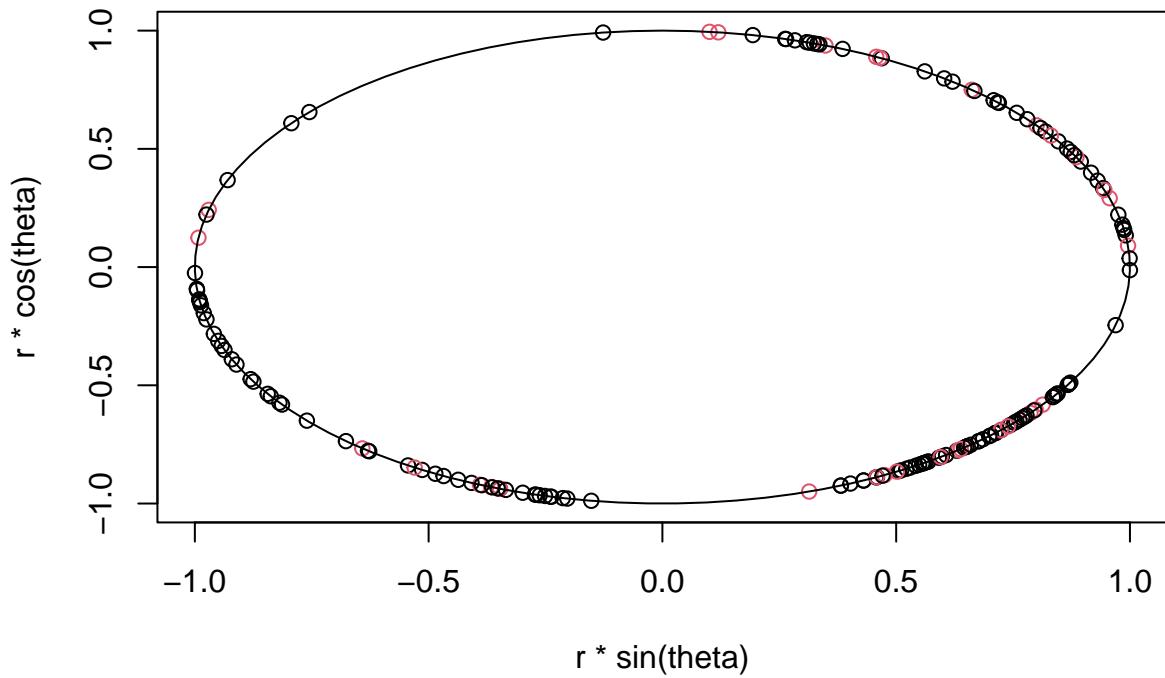


```

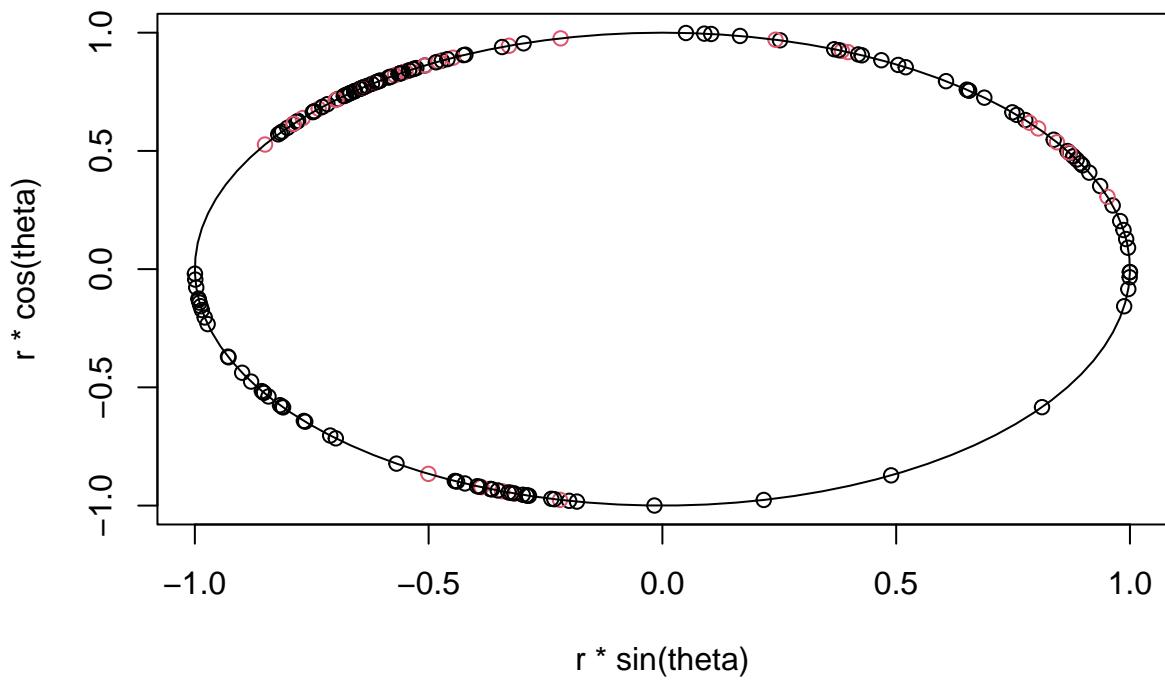
## [1] "Iteration 336"
## [1] "Iteration 337"
## [1] "Iteration 338"
## [1] "Iteration 339"

```

```
## [1] "Iteration 340"  
## [1] "Iteration 340: objective function value is 1.498708"
```

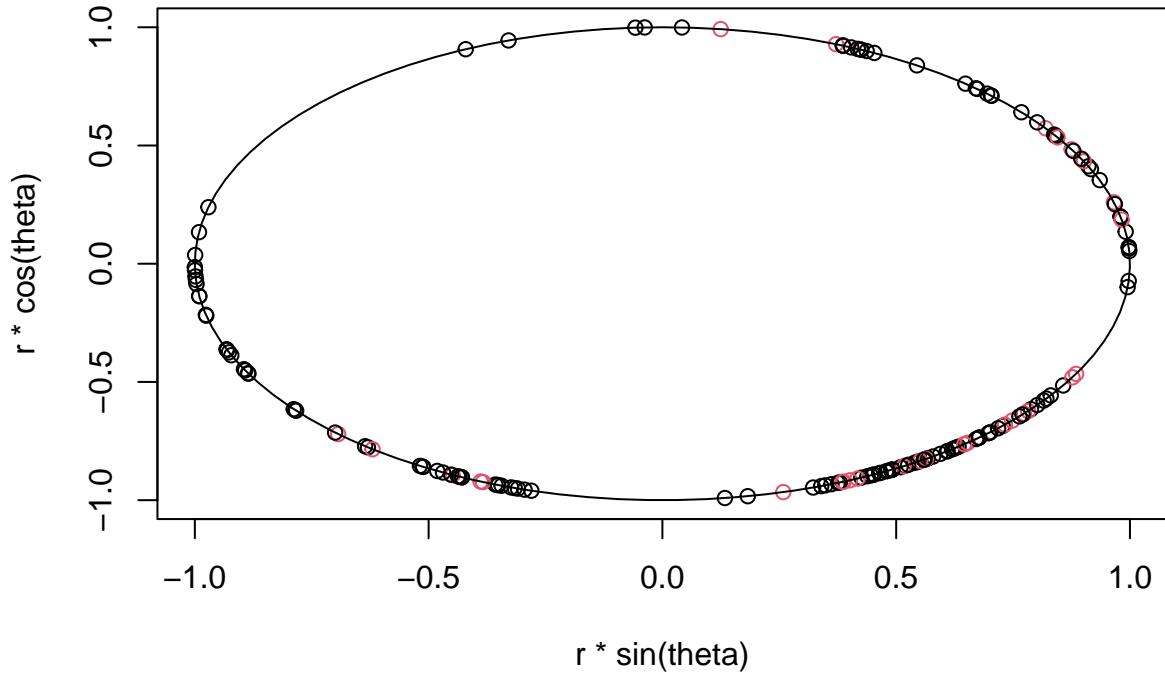


```
## [1] "Iteration 341"  
## [1] "Iteration 342"  
## [1] "Iteration 343"  
## [1] "Iteration 344"  
## [1] "Iteration 345"  
## [1] "Iteration 345: objective function value is 1.516195"
```

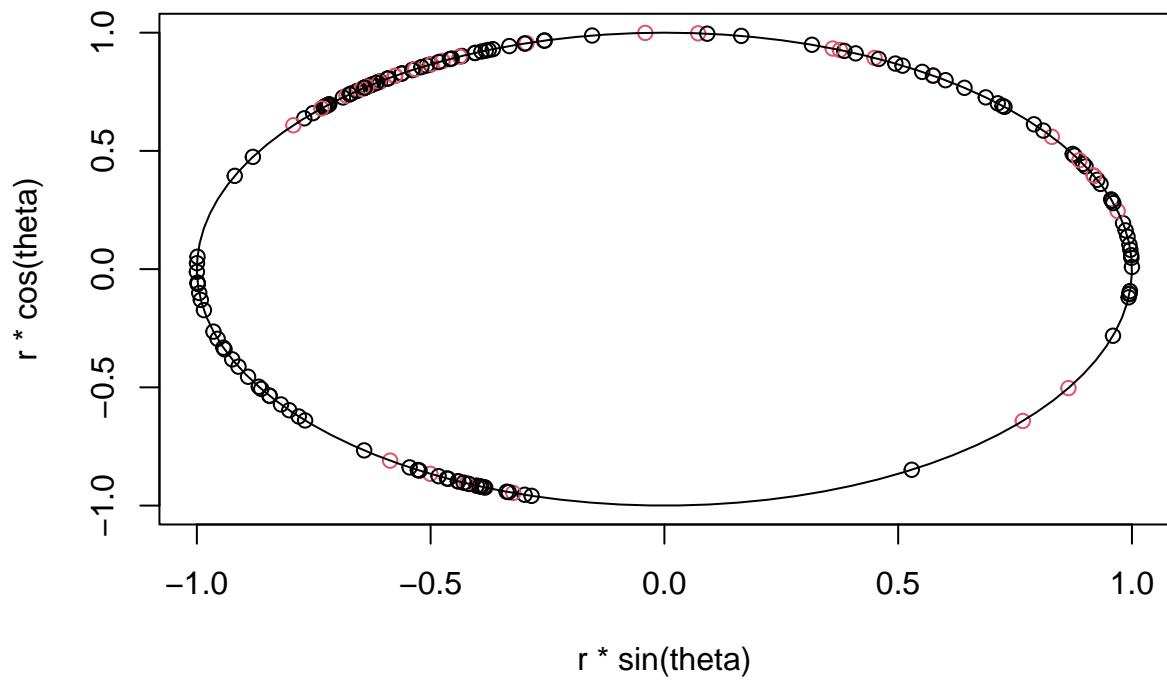


```
## [1] "Iteration 346"
```

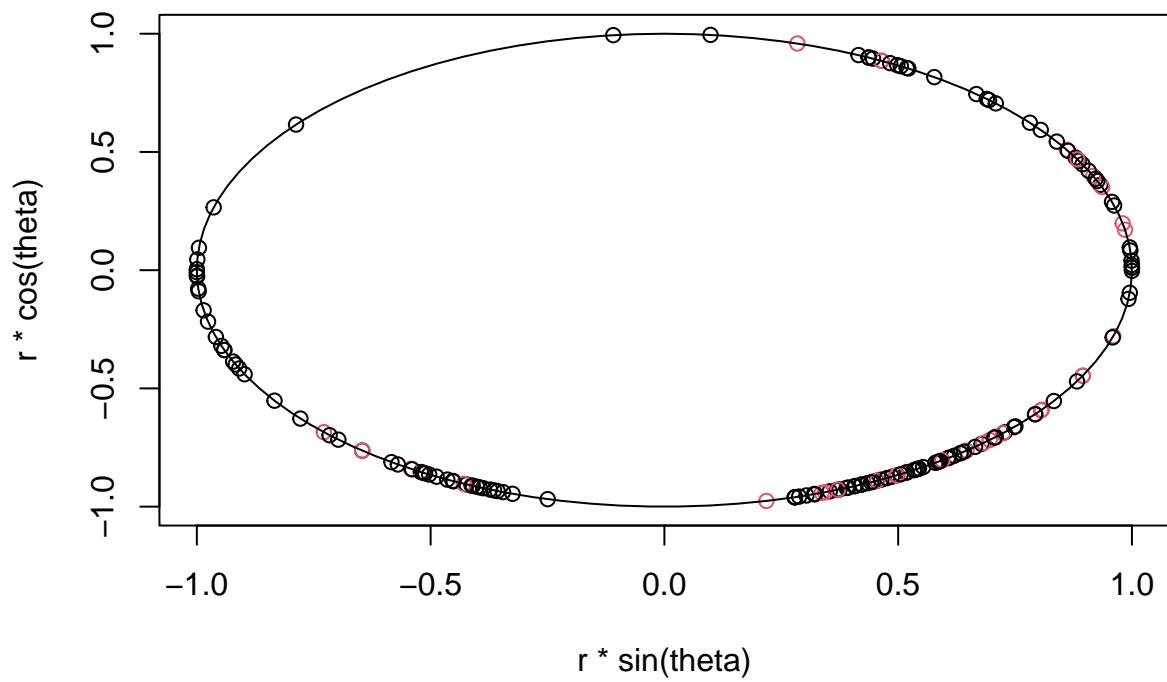
```
## [1] "Iteration 347"  
## [1] "Iteration 348"  
## [1] "Iteration 349"  
## [1] "Iteration 350"  
## [1] "Iteration 350: objective function value is 1.514890"
```



```
## [1] "Iteration 351"  
## [1] "Iteration 352"  
## [1] "Iteration 353"  
## [1] "Iteration 354"  
## [1] "Iteration 355"  
## [1] "Iteration 355: objective function value is 1.504420"
```

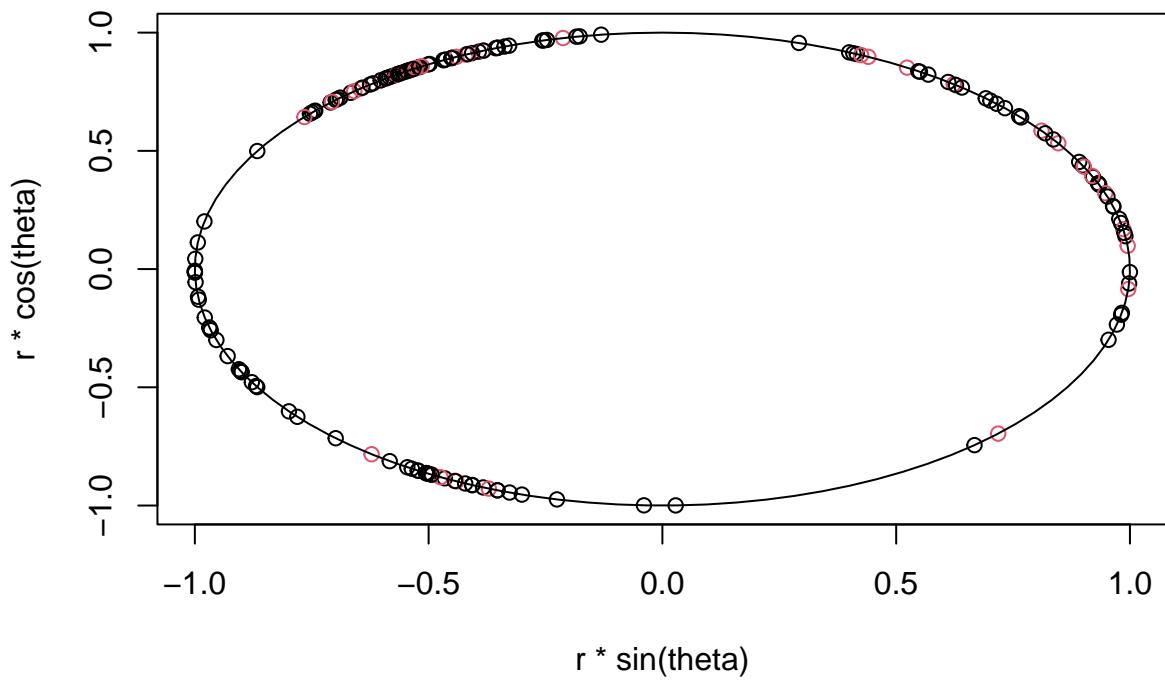


```
## [1] "Iteration 356"
## [1] "Iteration 357"
## [1] "Iteration 358"
## [1] "Iteration 359"
## [1] "Iteration 360"
## [1] "Iteration 360: objective function value is 1.488703"
```

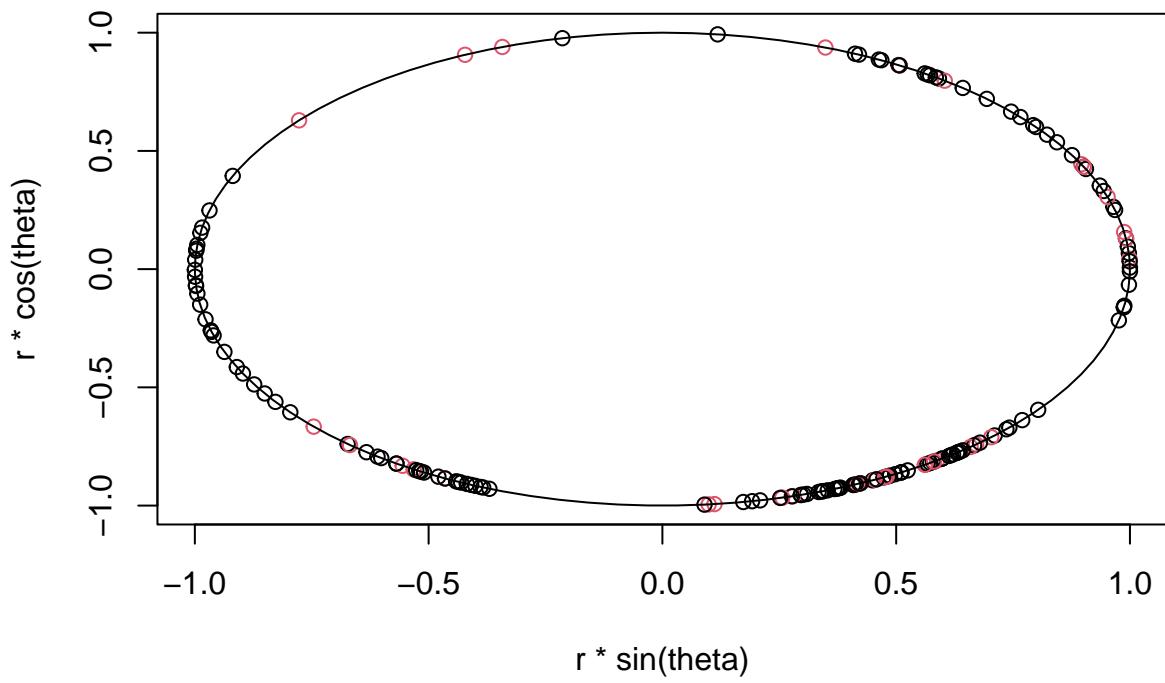


```
## [1] "Iteration 361"
## [1] "Iteration 362"
## [1] "Iteration 363"
## [1] "Iteration 364"
```

```
## [1] "Iteration 365"  
## [1] "Iteration 365: objective function value is 1.510617"
```

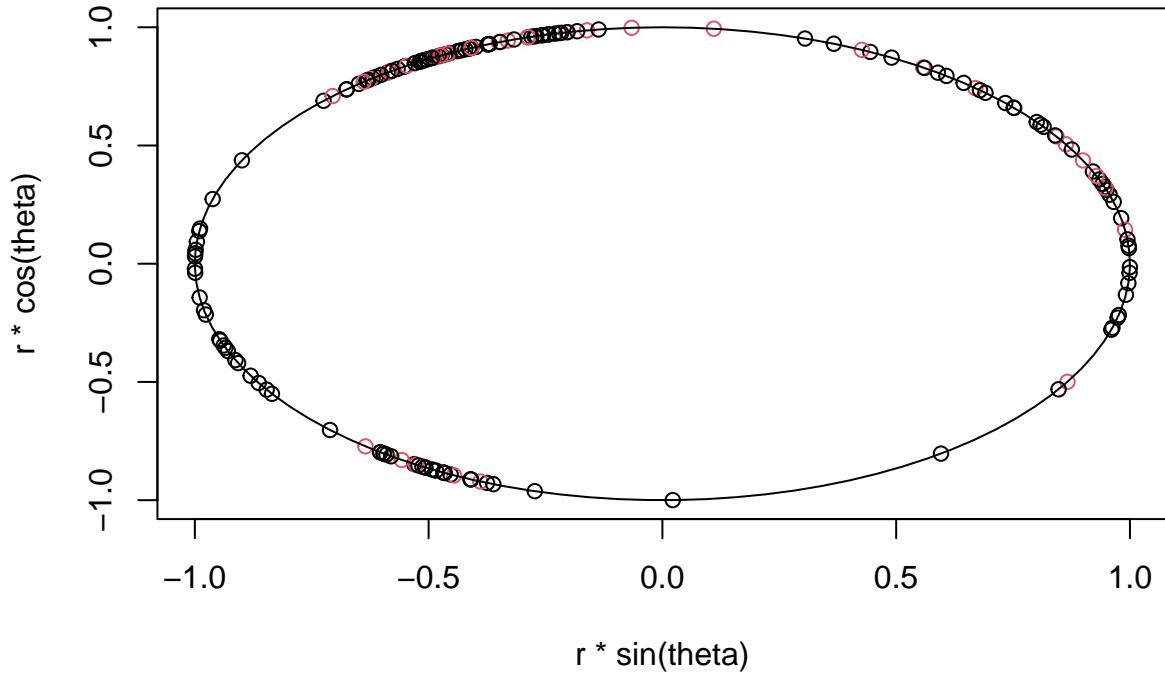


```
## [1] "Iteration 366"  
## [1] "Iteration 367"  
## [1] "Iteration 368"  
## [1] "Iteration 369"  
## [1] "Iteration 370"  
## [1] "Iteration 370: objective function value is 1.509500"
```

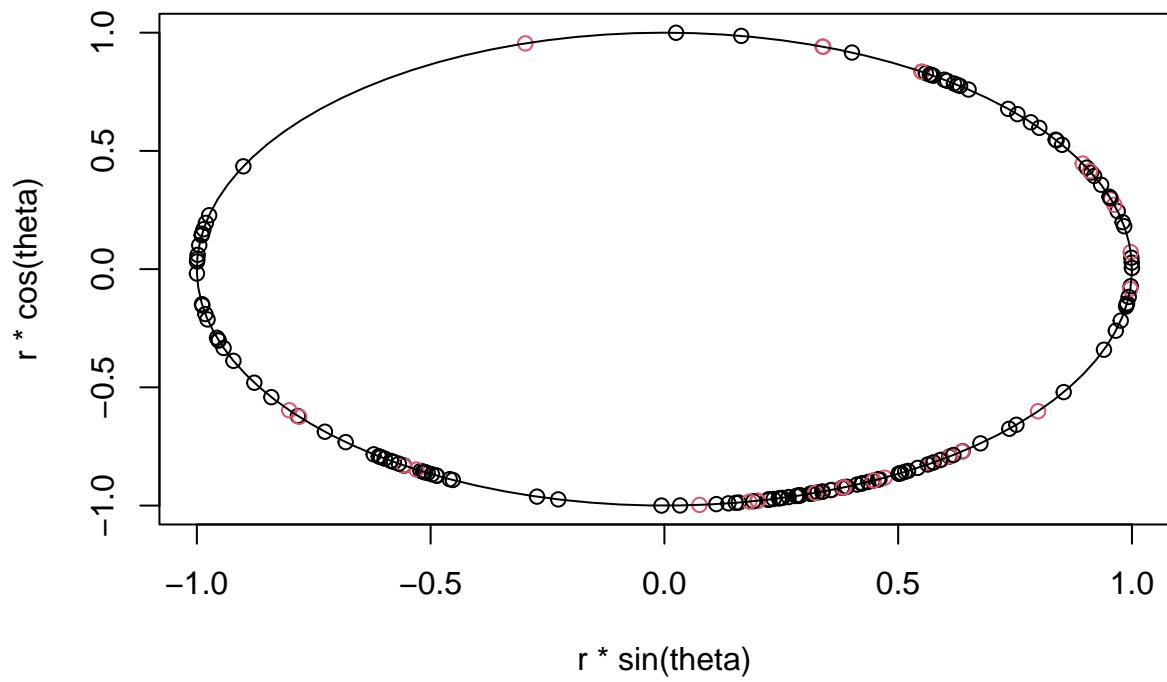


```
## [1] "Iteration 371"
```

```
## [1] "Iteration 372"  
## [1] "Iteration 373"  
## [1] "Iteration 374"  
## [1] "Iteration 375"  
## [1] "Iteration 375: objective function value is 1.523482"
```



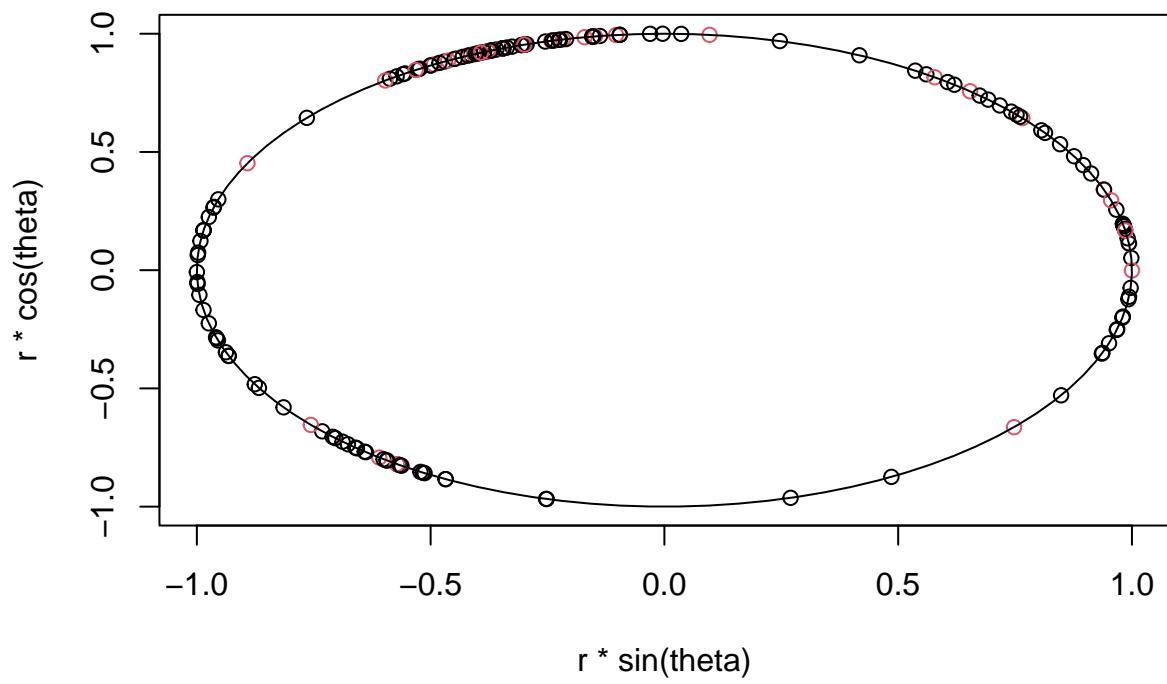
```
## [1] "Iteration 376"  
## [1] "Iteration 377"  
## [1] "Iteration 378"  
## [1] "Iteration 379"  
## [1] "Iteration 380"  
## [1] "Iteration 380: objective function value is 1.521047"
```



```

## [1] "Iteration 381"
## [1] "Iteration 382"
## [1] "Iteration 383"
## [1] "Iteration 384"
## [1] "Iteration 385"
## [1] "Iteration 385: objective function value is 1.519989"

```

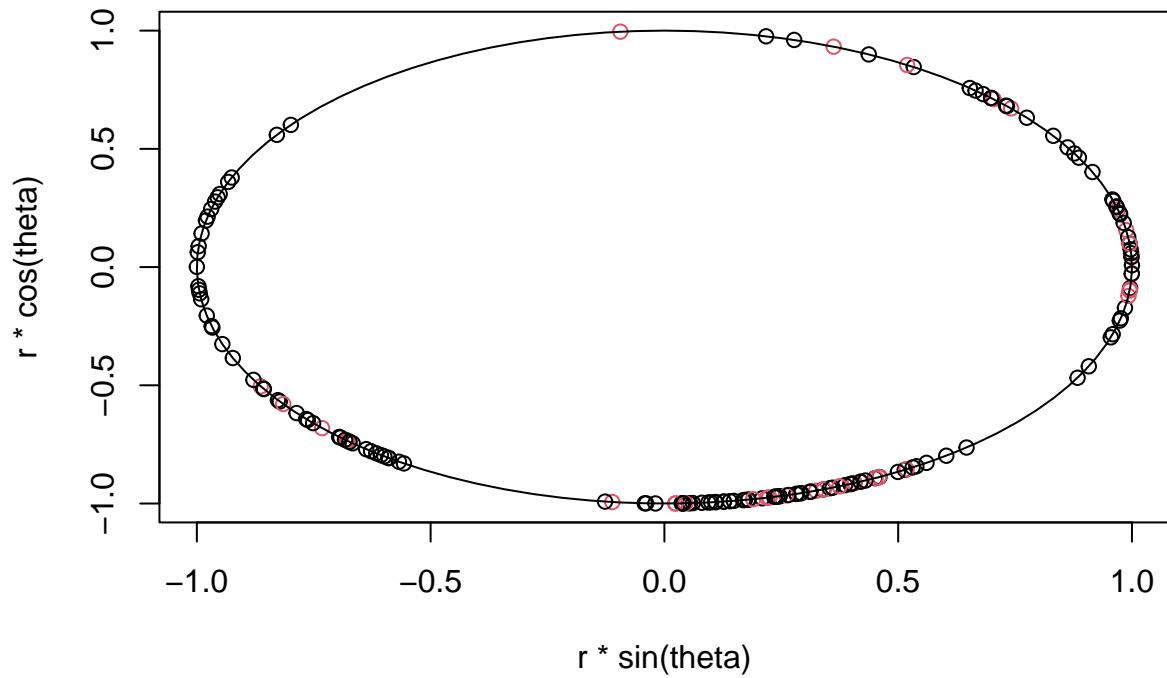


```

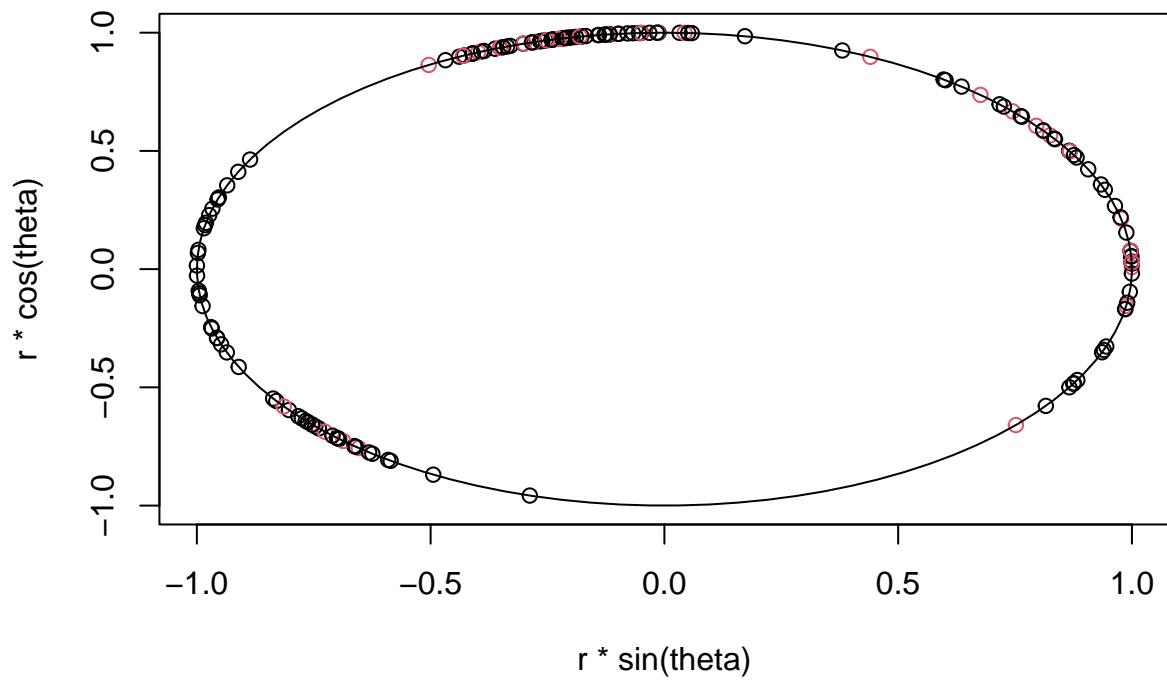
## [1] "Iteration 386"
## [1] "Iteration 387"
## [1] "Iteration 388"
## [1] "Iteration 389"

```

```
## [1] "Iteration 390"  
## [1] "Iteration 390: objective function value is 1.509648"
```

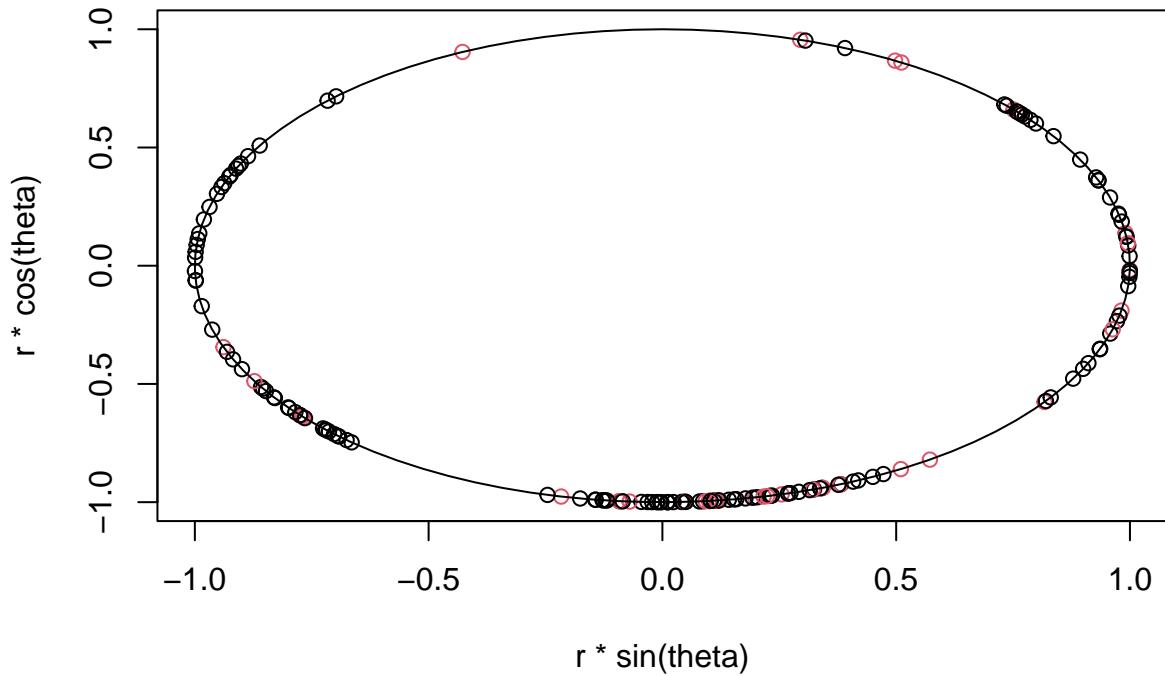


```
## [1] "Iteration 391"  
## [1] "Iteration 392"  
## [1] "Iteration 393"  
## [1] "Iteration 394"  
## [1] "Iteration 395"  
## [1] "Iteration 395: objective function value is 1.495005"
```

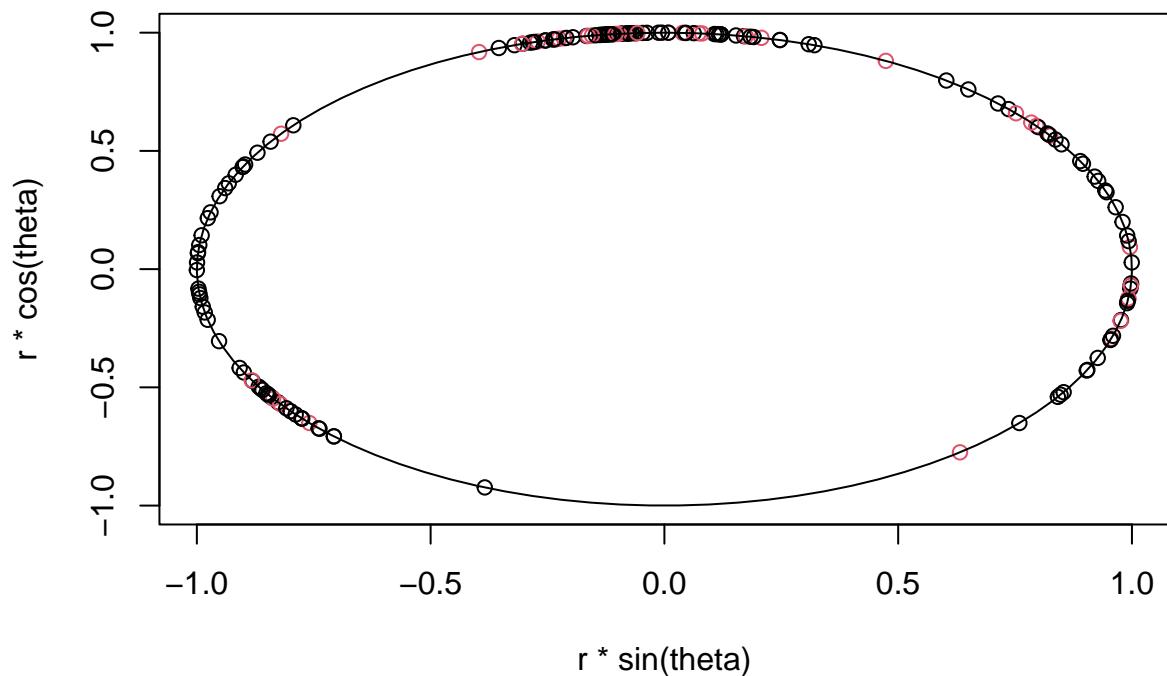


```
## [1] "Iteration 396"
```

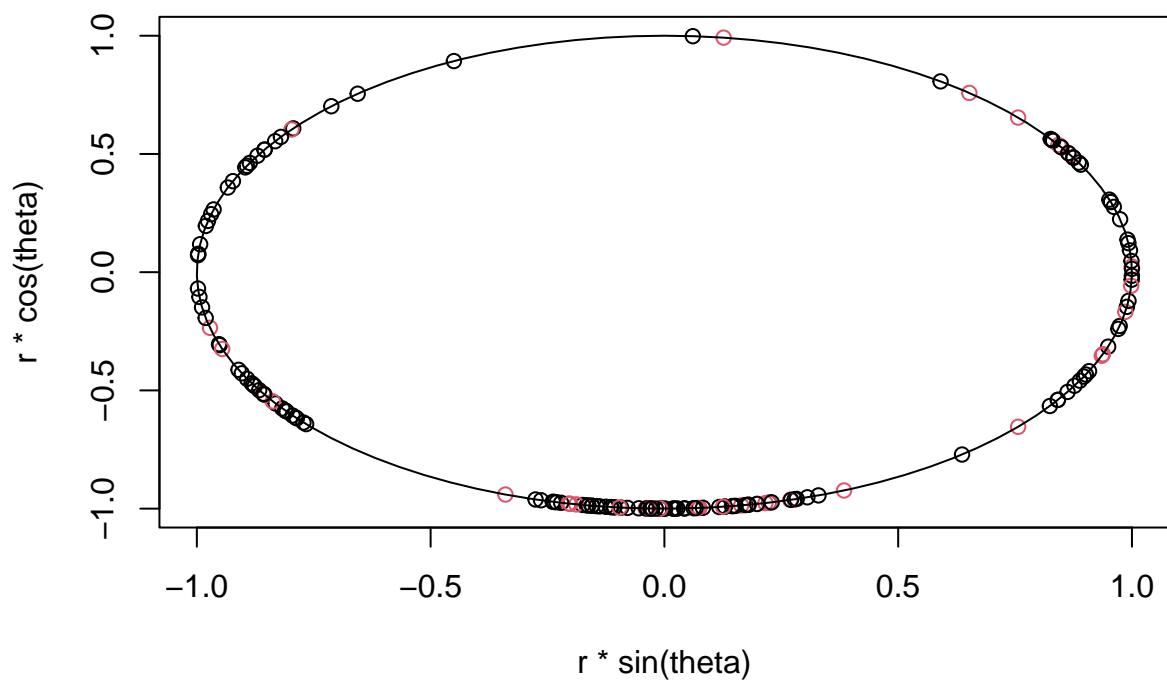
```
## [1] "Iteration 397"  
## [1] "Iteration 398"  
## [1] "Iteration 399"  
## [1] "Iteration 400"  
## [1] "Iteration 400: objective function value is 1.512476"
```



```
## [1] "Iteration 401"  
## [1] "Iteration 402"  
## [1] "Iteration 403"  
## [1] "Iteration 404"  
## [1] "Iteration 405"  
## [1] "Iteration 405: objective function value is 1.511841"
```

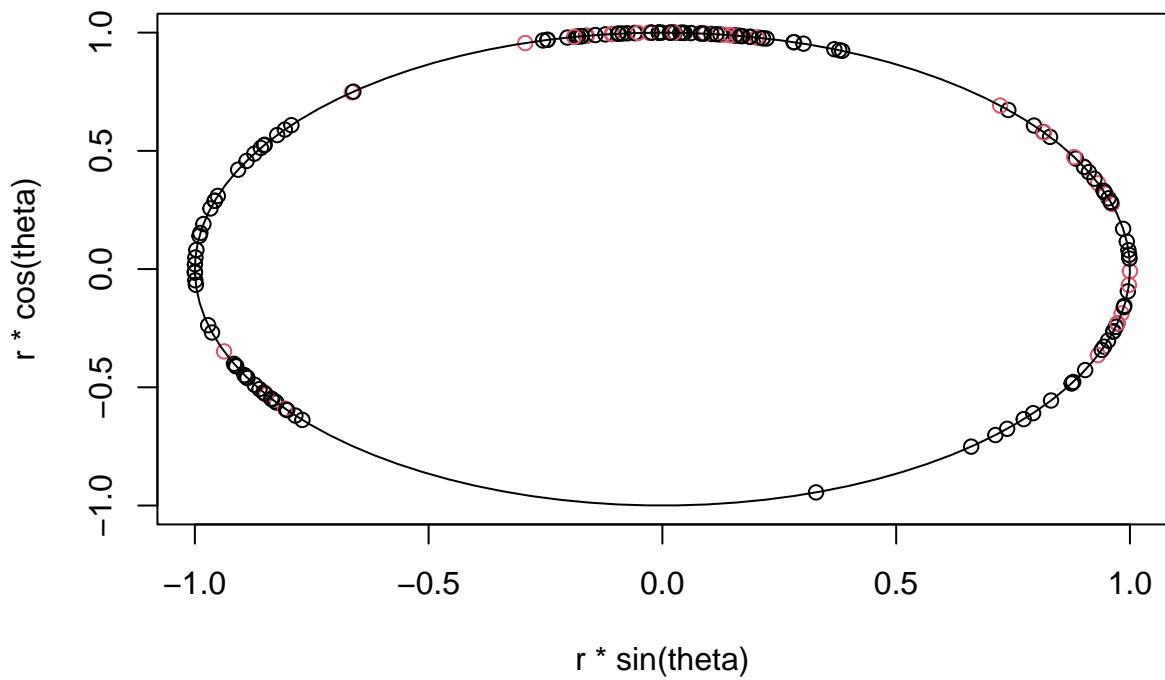


```
## [1] "Iteration 406"
## [1] "Iteration 407"
## [1] "Iteration 408"
## [1] "Iteration 409"
## [1] "Iteration 410"
## [1] "Iteration 410: objective function value is 1.527808"
```

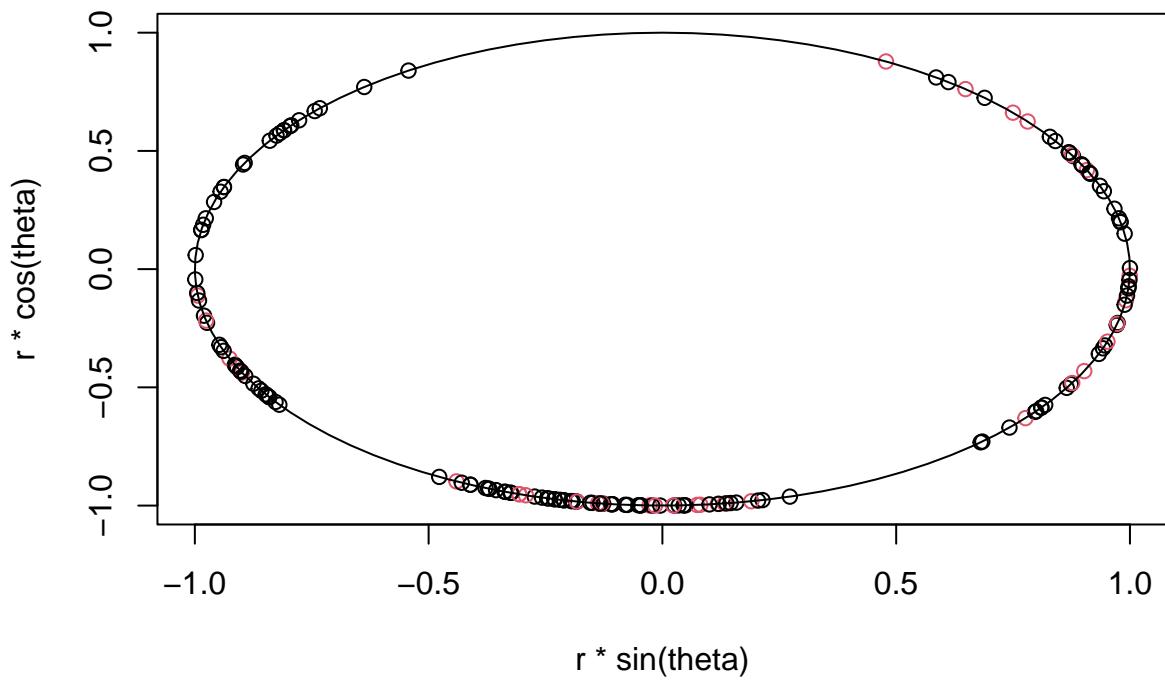


```
## [1] "Iteration 411"
## [1] "Iteration 412"
## [1] "Iteration 413"
## [1] "Iteration 414"
```

```
## [1] "Iteration 415"  
## [1] "Iteration 415: objective function value is 1.515433"
```

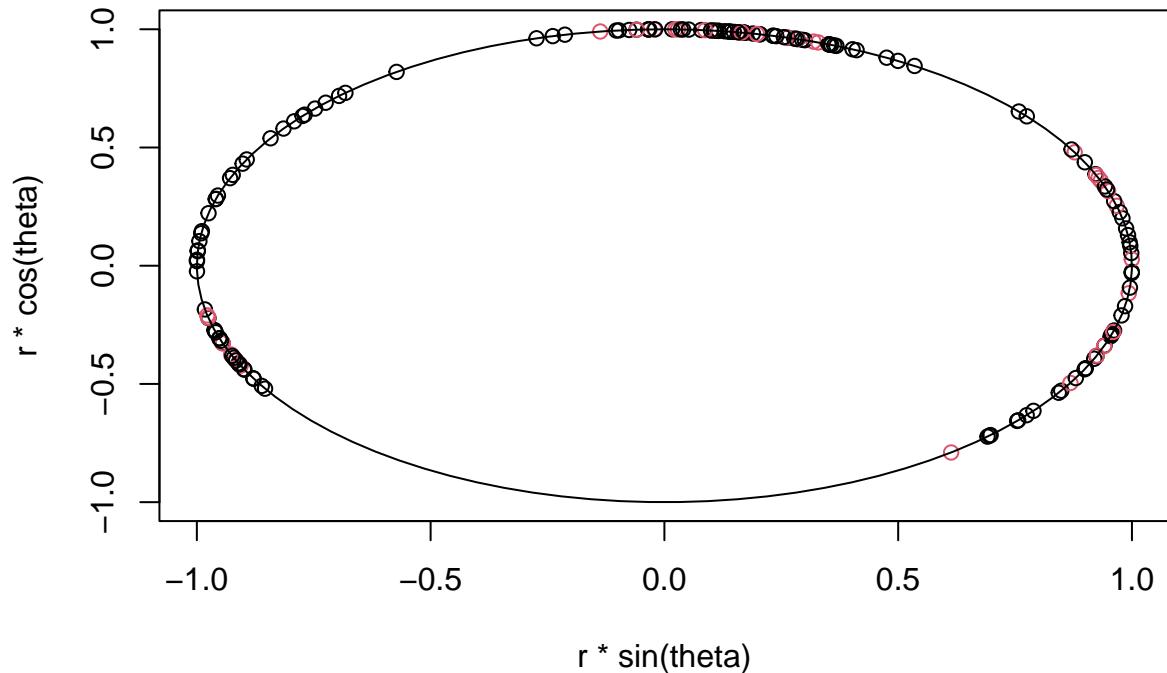


```
## [1] "Iteration 416"  
## [1] "Iteration 417"  
## [1] "Iteration 418"  
## [1] "Iteration 419"  
## [1] "Iteration 420"  
## [1] "Iteration 420: objective function value is 1.509169"
```

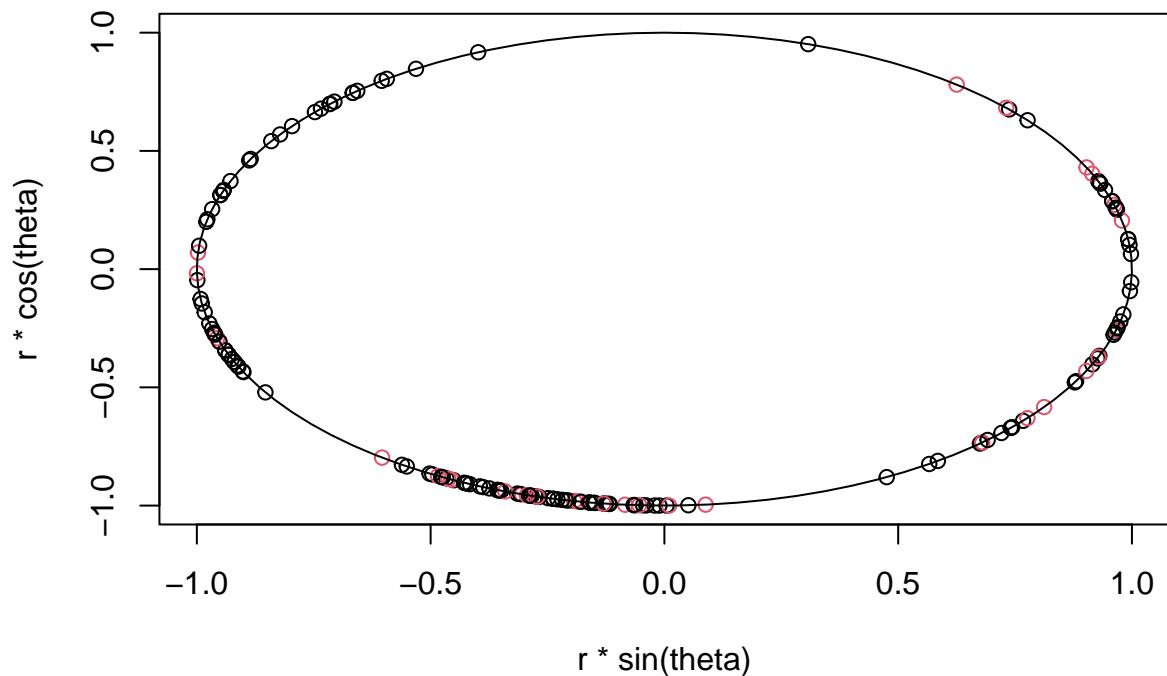


```
## [1] "Iteration 421"
```

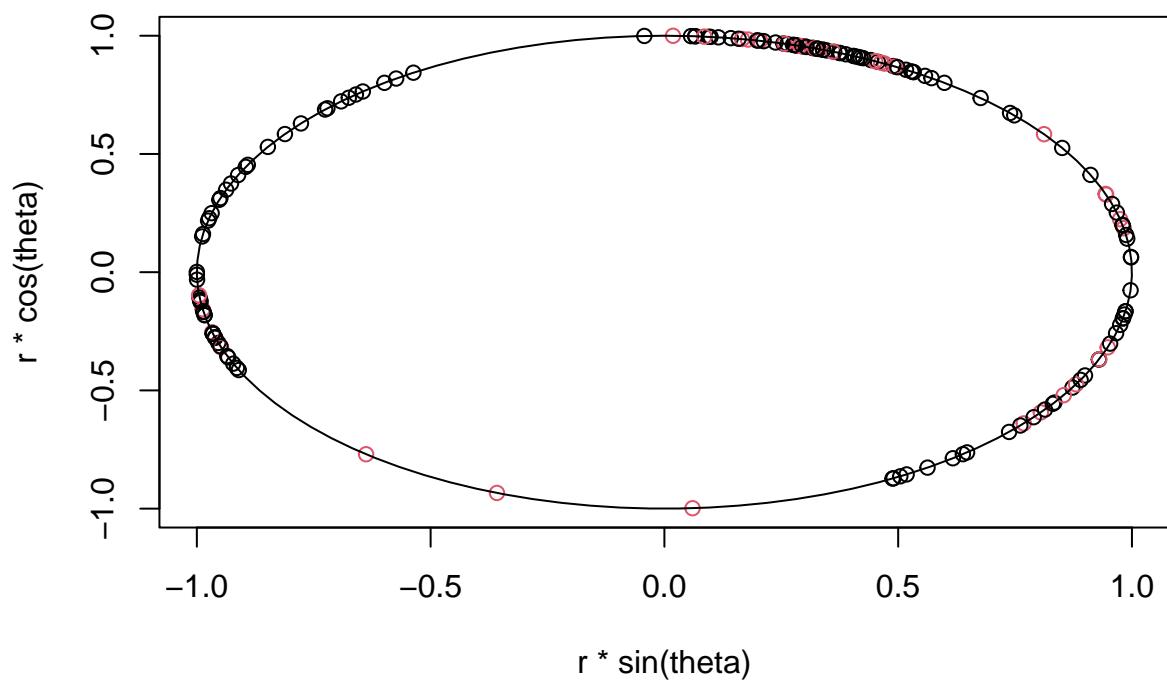
```
## [1] "Iteration 422"  
## [1] "Iteration 423"  
## [1] "Iteration 424"  
## [1] "Iteration 425"  
## [1] "Iteration 425: objective function value is 1.499341"
```



```
## [1] "Iteration 426"  
## [1] "Iteration 427"  
## [1] "Iteration 428"  
## [1] "Iteration 429"  
## [1] "Iteration 430"  
## [1] "Iteration 430: objective function value is 1.503317"
```

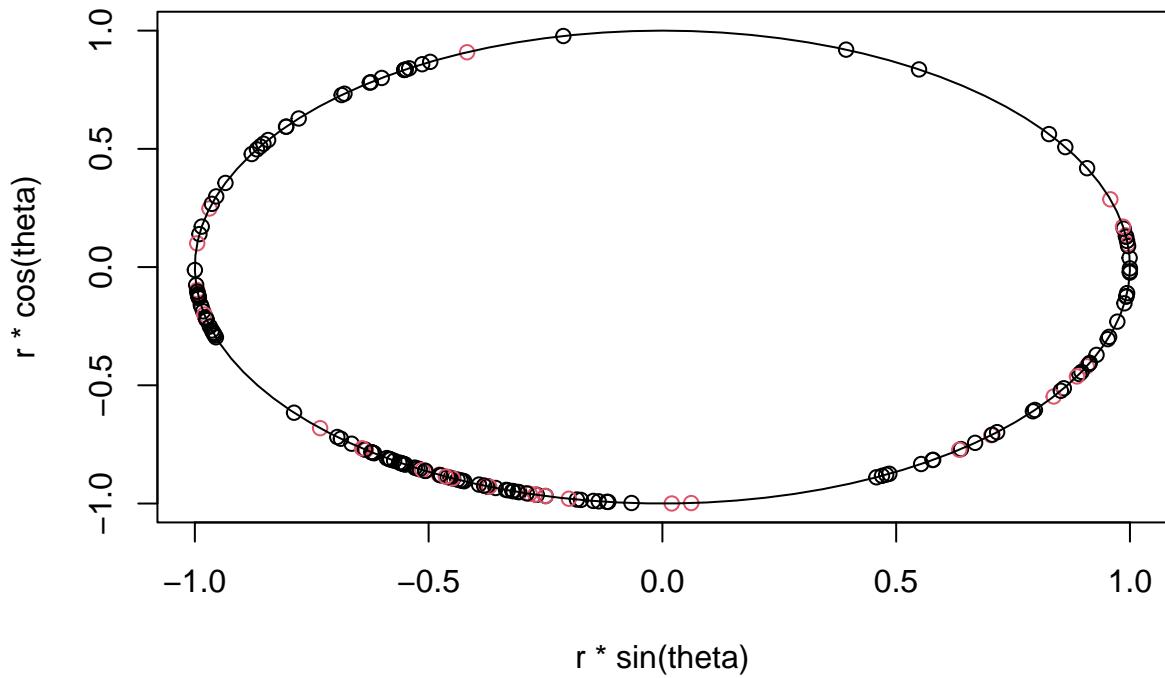


```
## [1] "Iteration 431"
## [1] "Iteration 432"
## [1] "Iteration 433"
## [1] "Iteration 434"
## [1] "Iteration 435"
## [1] "Iteration 435: objective function value is 1.507306"
```

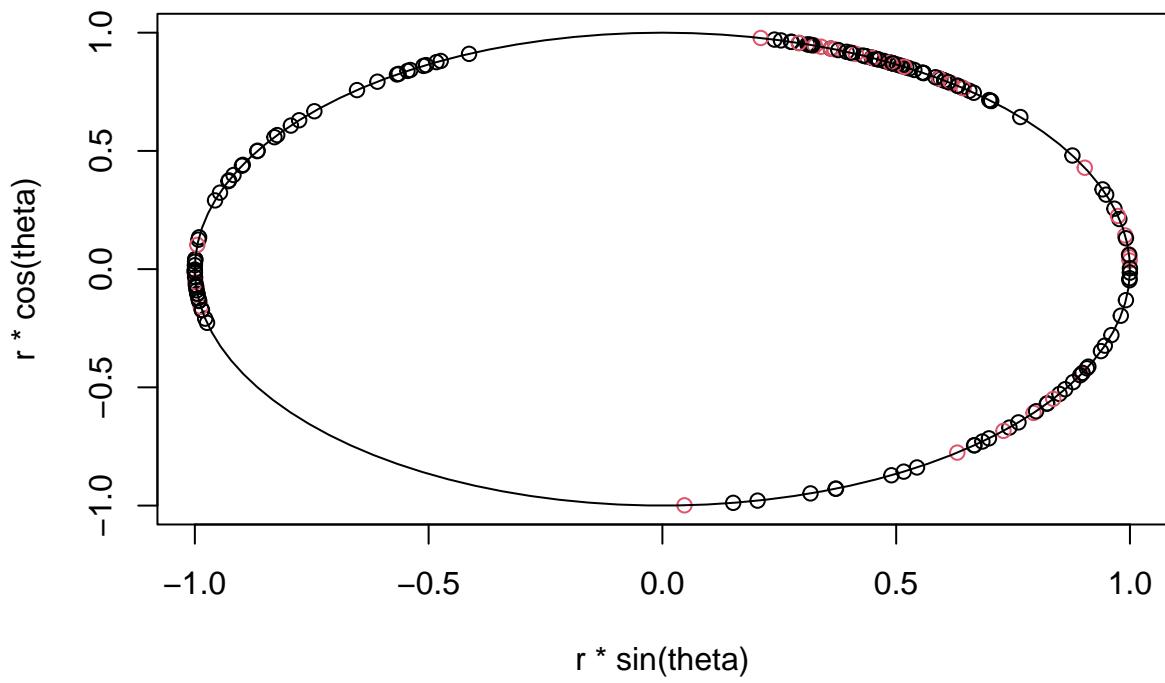


```
## [1] "Iteration 436"
## [1] "Iteration 437"
## [1] "Iteration 438"
## [1] "Iteration 439"
```

```
## [1] "Iteration 440"  
## [1] "Iteration 440: objective function value is 1.517725"
```

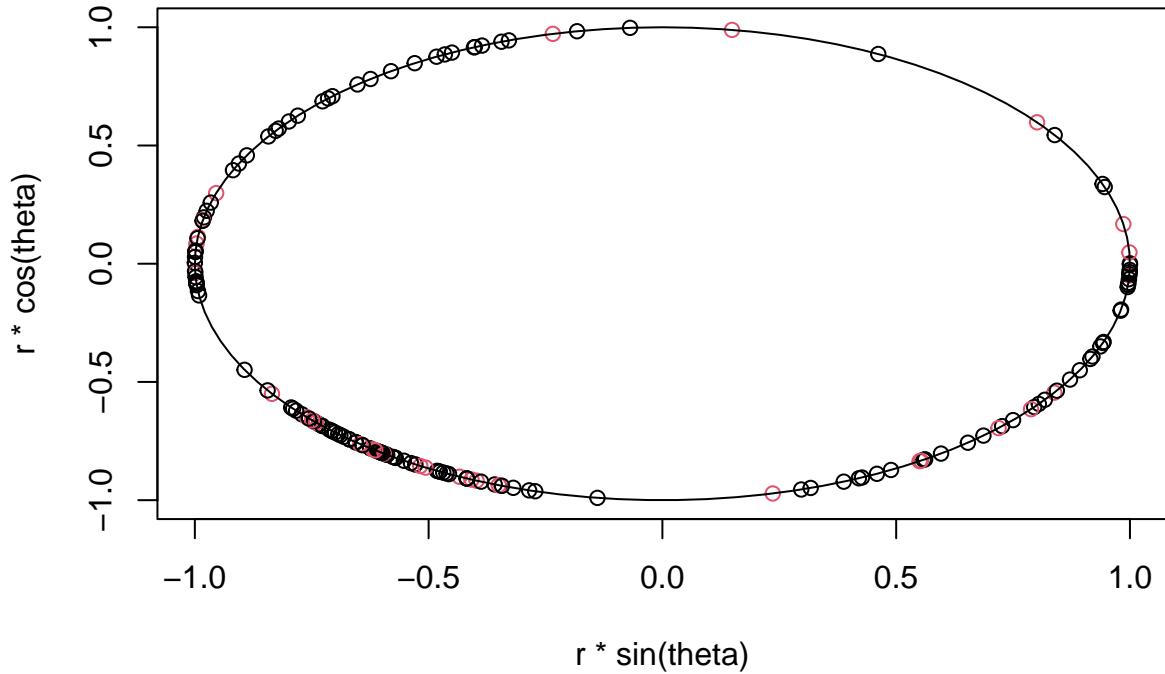


```
## [1] "Iteration 441"  
## [1] "Iteration 442"  
## [1] "Iteration 443"  
## [1] "Iteration 444"  
## [1] "Iteration 445"  
## [1] "Iteration 445: objective function value is 1.516041"
```

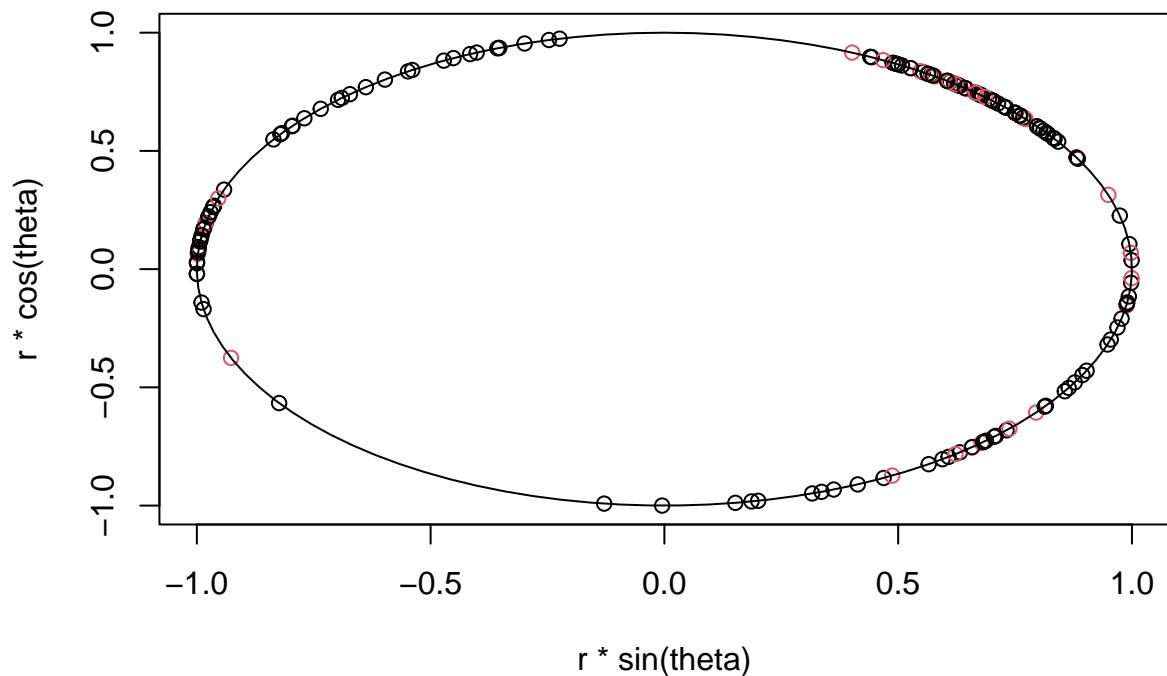


```
## [1] "Iteration 446"
```

```
## [1] "Iteration 447"  
## [1] "Iteration 448"  
## [1] "Iteration 449"  
## [1] "Iteration 450"  
## [1] "Iteration 450: objective function value is 1.527546"
```



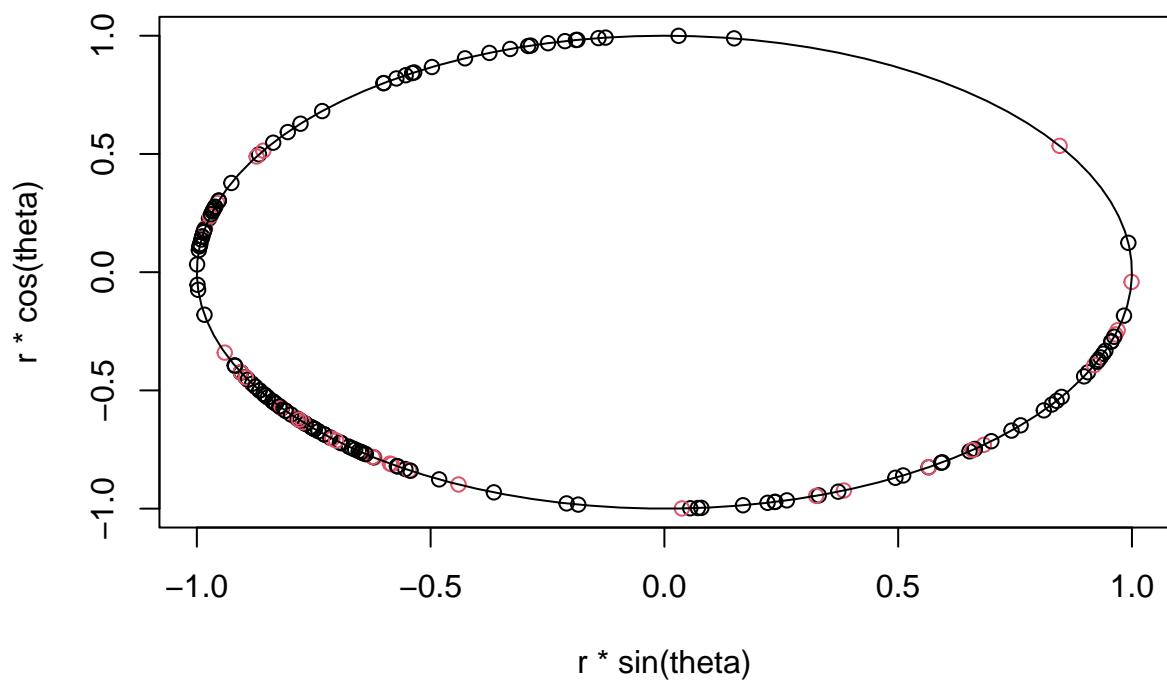
```
## [1] "Iteration 451"  
## [1] "Iteration 452"  
## [1] "Iteration 453"  
## [1] "Iteration 454"  
## [1] "Iteration 455"  
## [1] "Iteration 455: objective function value is 1.518391"
```



```

## [1] "Iteration 456"
## [1] "Iteration 457"
## [1] "Iteration 458"
## [1] "Iteration 459"
## [1] "Iteration 460"
## [1] "Iteration 460: objective function value is 1.488825"

```

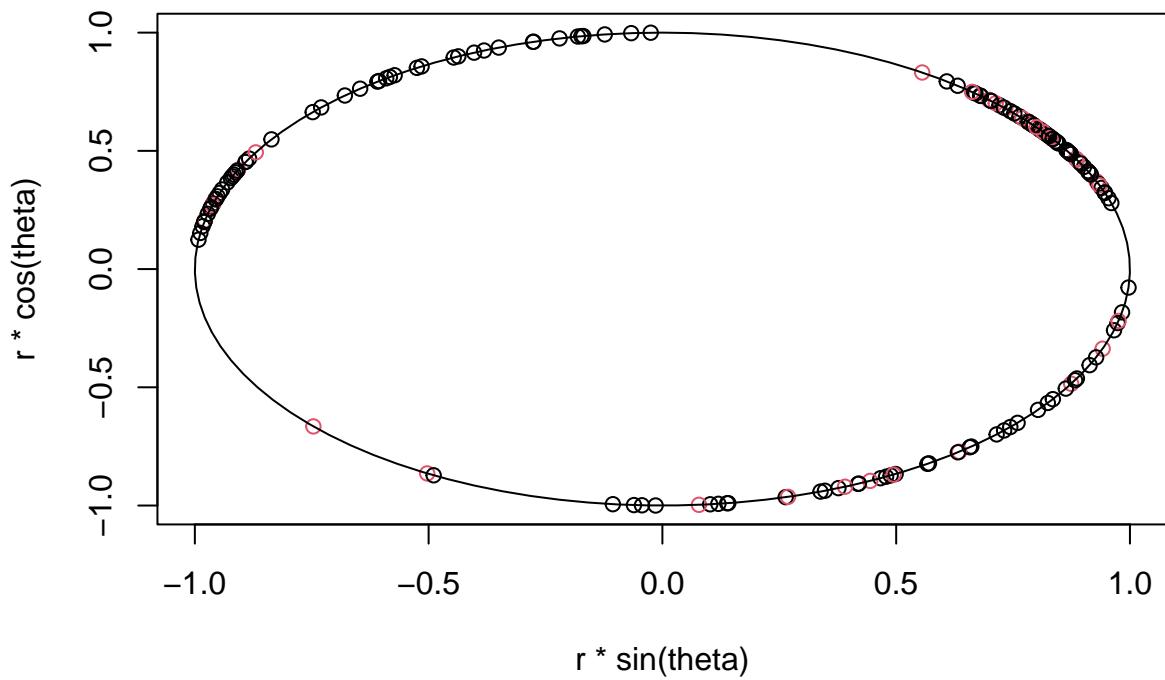


```

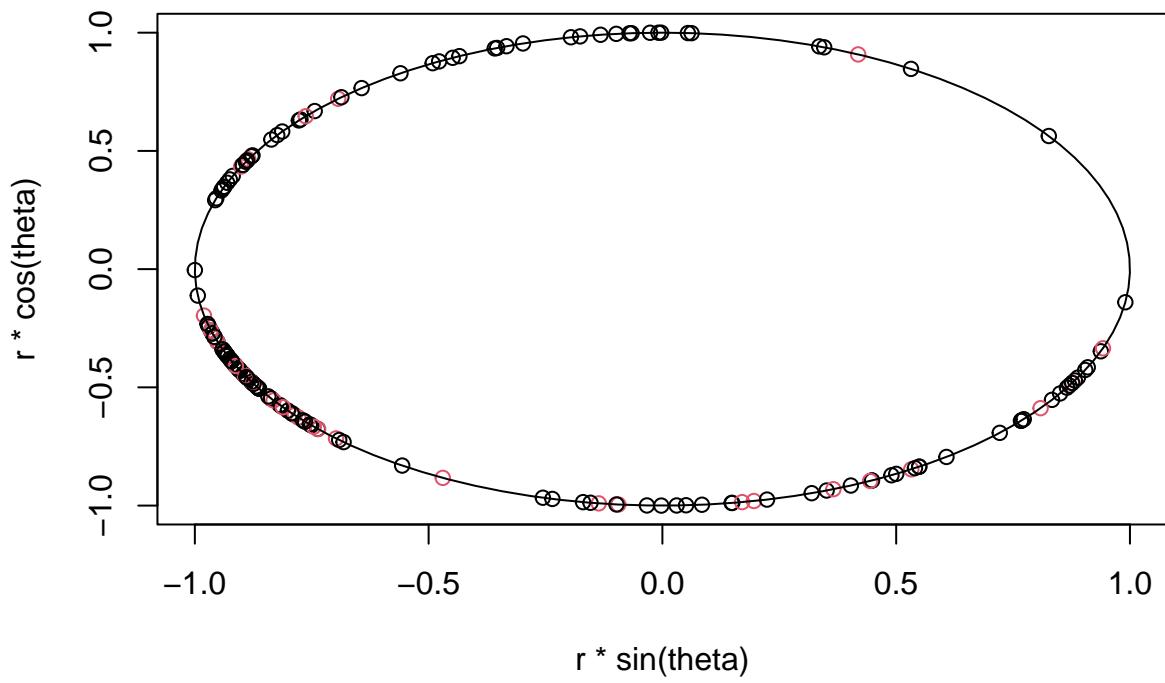
## [1] "Iteration 461"
## [1] "Iteration 462"
## [1] "Iteration 463"
## [1] "Iteration 464"

```

```
## [1] "Iteration 465"  
## [1] "Iteration 465: objective function value is 1.514416"
```

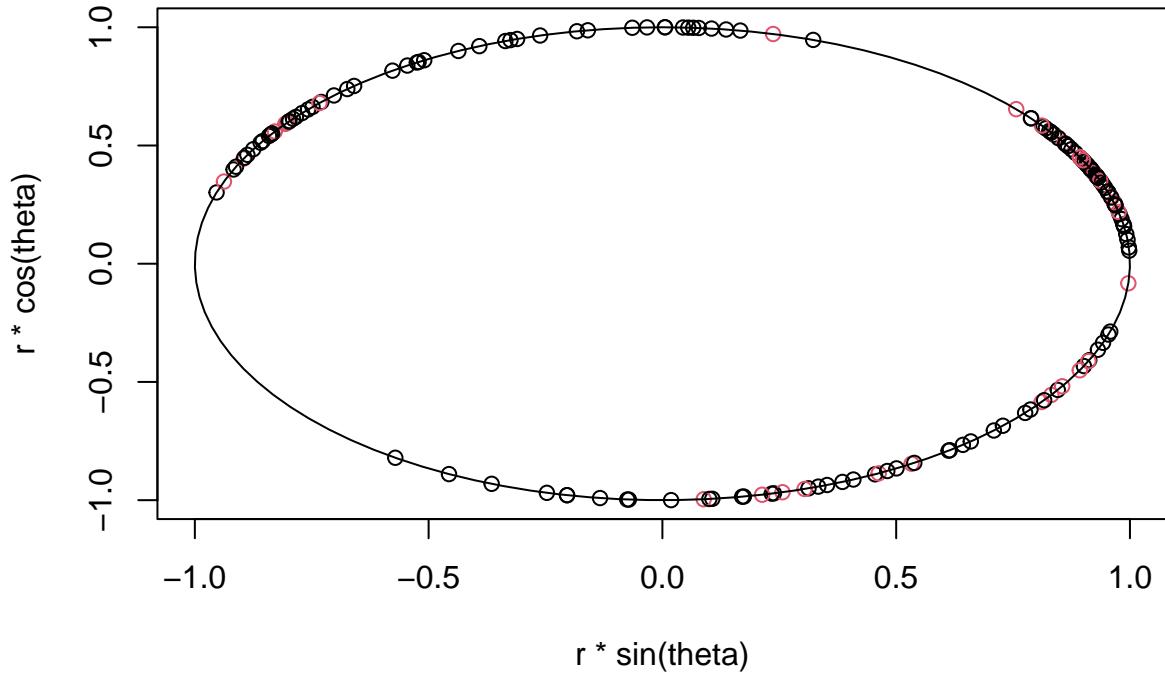


```
## [1] "Iteration 466"  
## [1] "Iteration 467"  
## [1] "Iteration 468"  
## [1] "Iteration 469"  
## [1] "Iteration 470"  
## [1] "Iteration 470: objective function value is 1.524092"
```

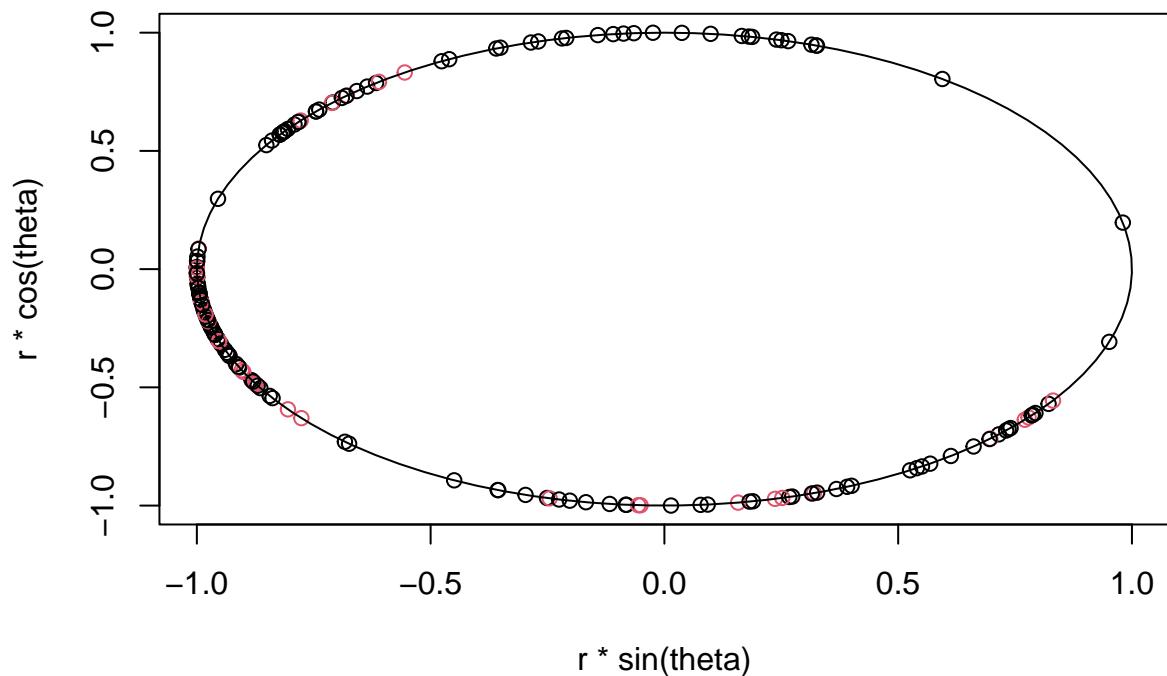


```
## [1] "Iteration 471"
```

```
## [1] "Iteration 472"  
## [1] "Iteration 473"  
## [1] "Iteration 474"  
## [1] "Iteration 475"  
## [1] "Iteration 475: objective function value is 1.508066"
```



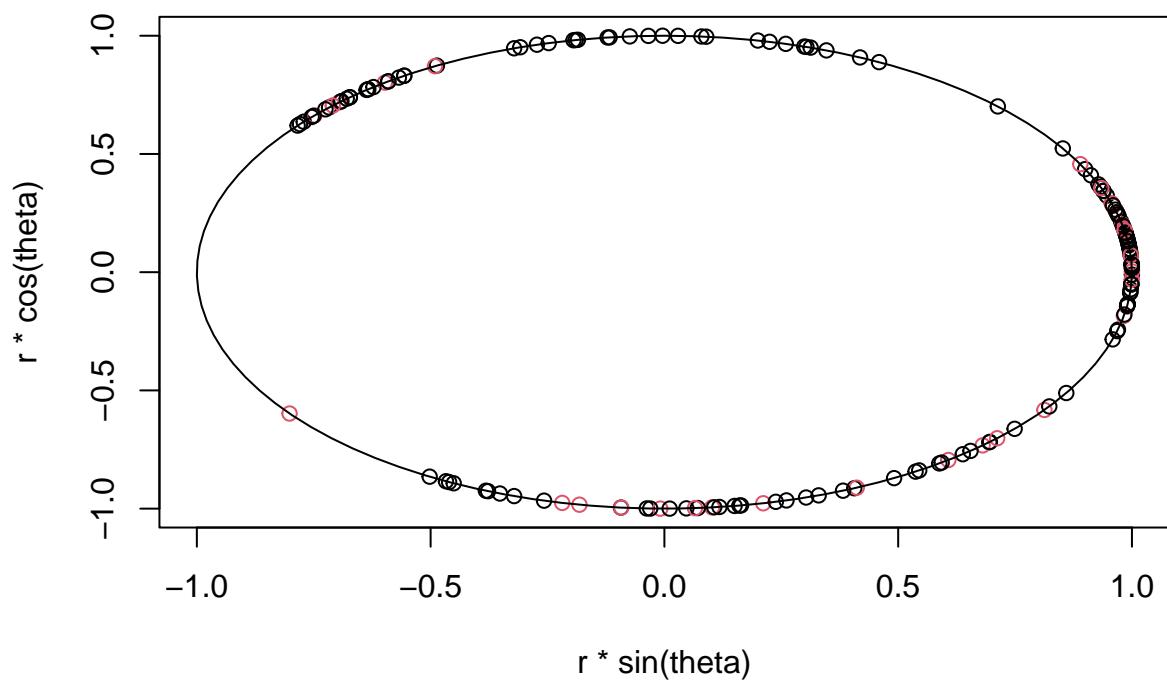
```
## [1] "Iteration 476"  
## [1] "Iteration 477"  
## [1] "Iteration 478"  
## [1] "Iteration 479"  
## [1] "Iteration 480"  
## [1] "Iteration 480: objective function value is 1.503182"
```



```

## [1] "Iteration 481"
## [1] "Iteration 482"
## [1] "Iteration 483"
## [1] "Iteration 484"
## [1] "Iteration 485"
## [1] "Iteration 485: objective function value is 1.514327"

```

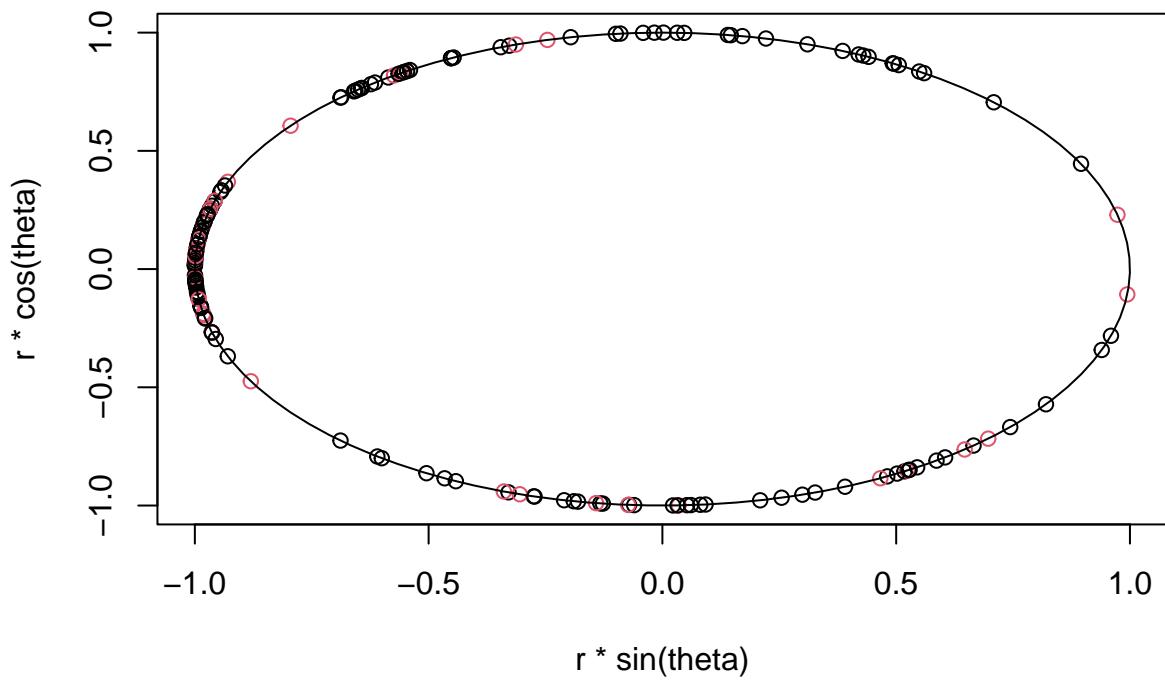


```

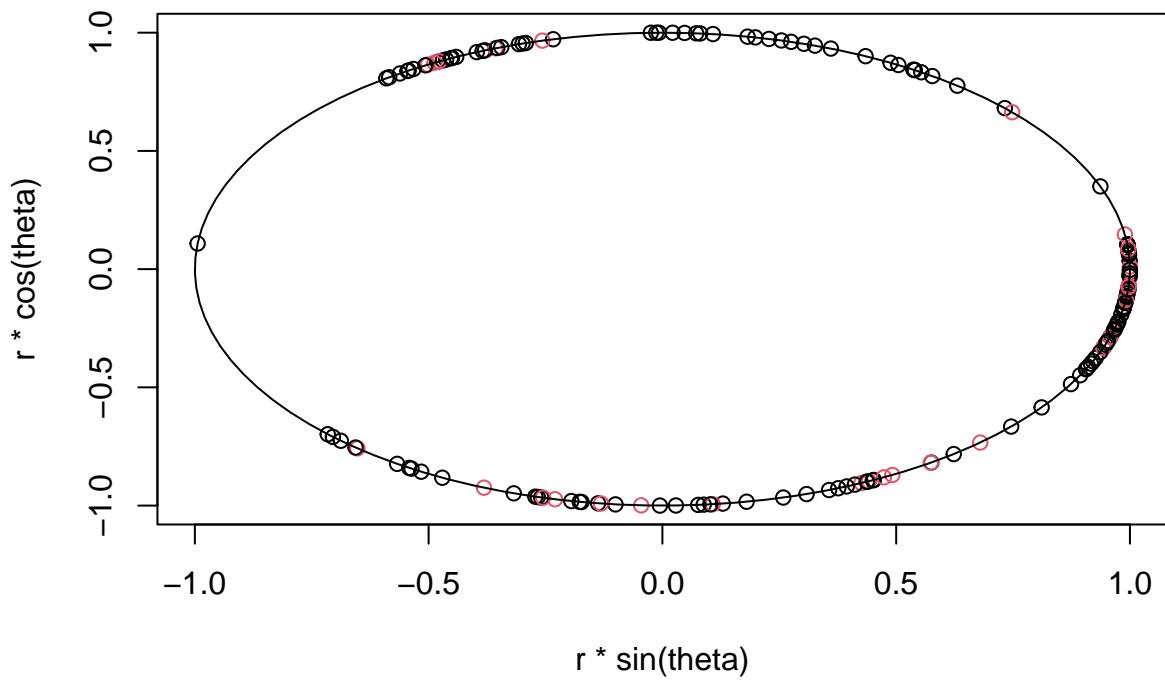
## [1] "Iteration 486"
## [1] "Iteration 487"
## [1] "Iteration 488"
## [1] "Iteration 489"

```

```
## [1] "Iteration 490"  
## [1] "Iteration 490: objective function value is 1.533919"
```

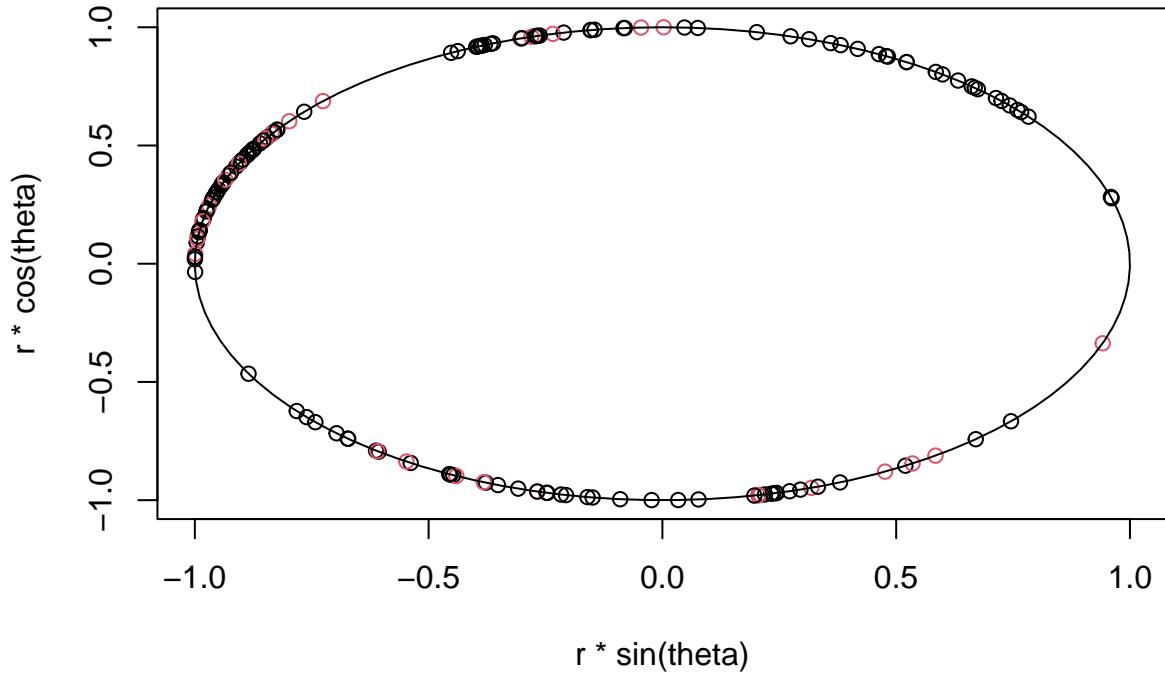


```
## [1] "Iteration 491"  
## [1] "Iteration 492"  
## [1] "Iteration 493"  
## [1] "Iteration 494"  
## [1] "Iteration 495"  
## [1] "Iteration 495: objective function value is 1.500763"
```

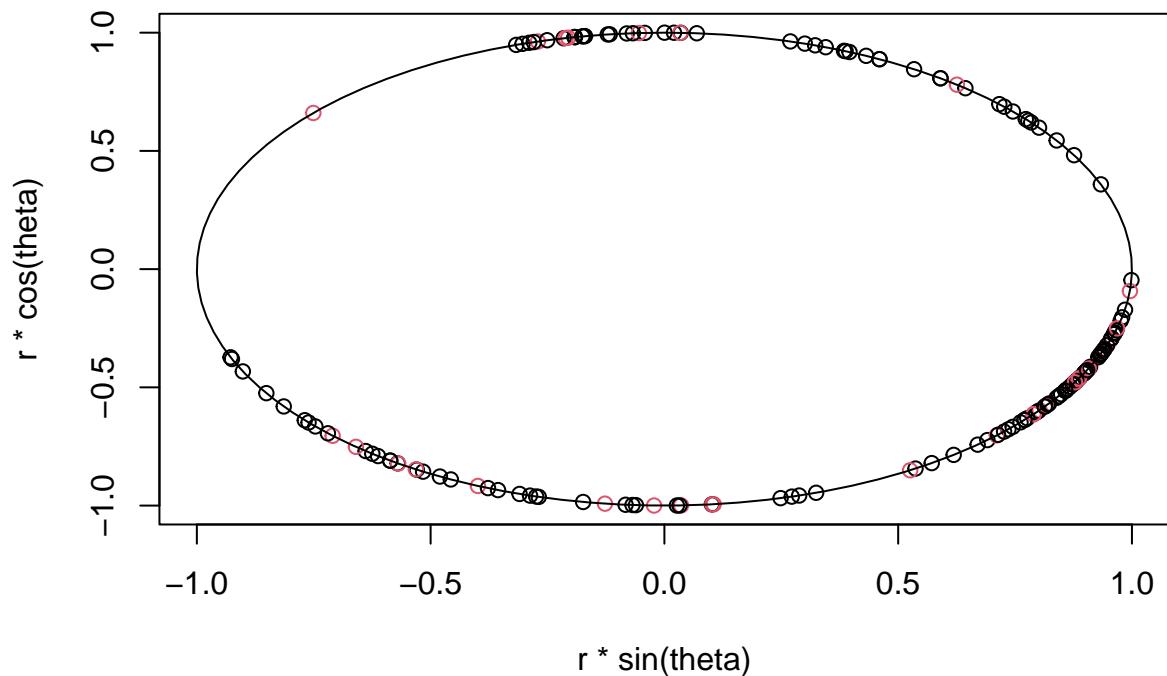


```
## [1] "Iteration 496"
```

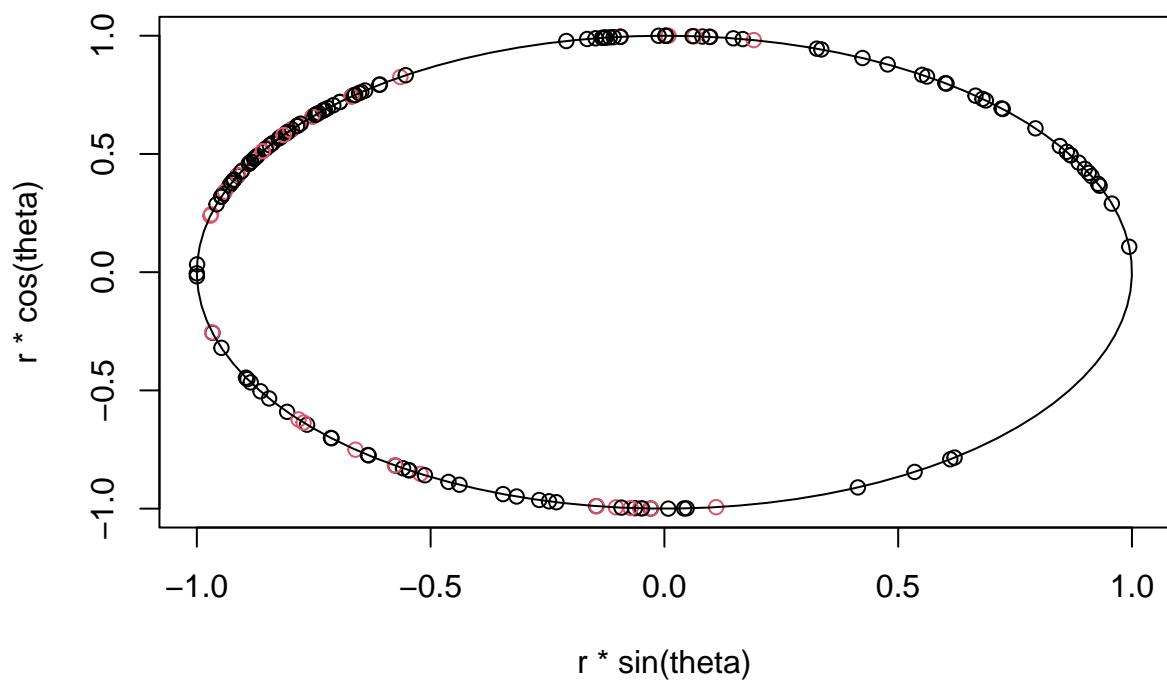
```
## [1] "Iteration 497"  
## [1] "Iteration 498"  
## [1] "Iteration 499"  
## [1] "Iteration 500"  
## [1] "Iteration 500: objective function value is 1.513197"
```



```
## [1] "Iteration 501"  
## [1] "Iteration 502"  
## [1] "Iteration 503"  
## [1] "Iteration 504"  
## [1] "Iteration 505"  
## [1] "Iteration 505: objective function value is 1.524744"
```

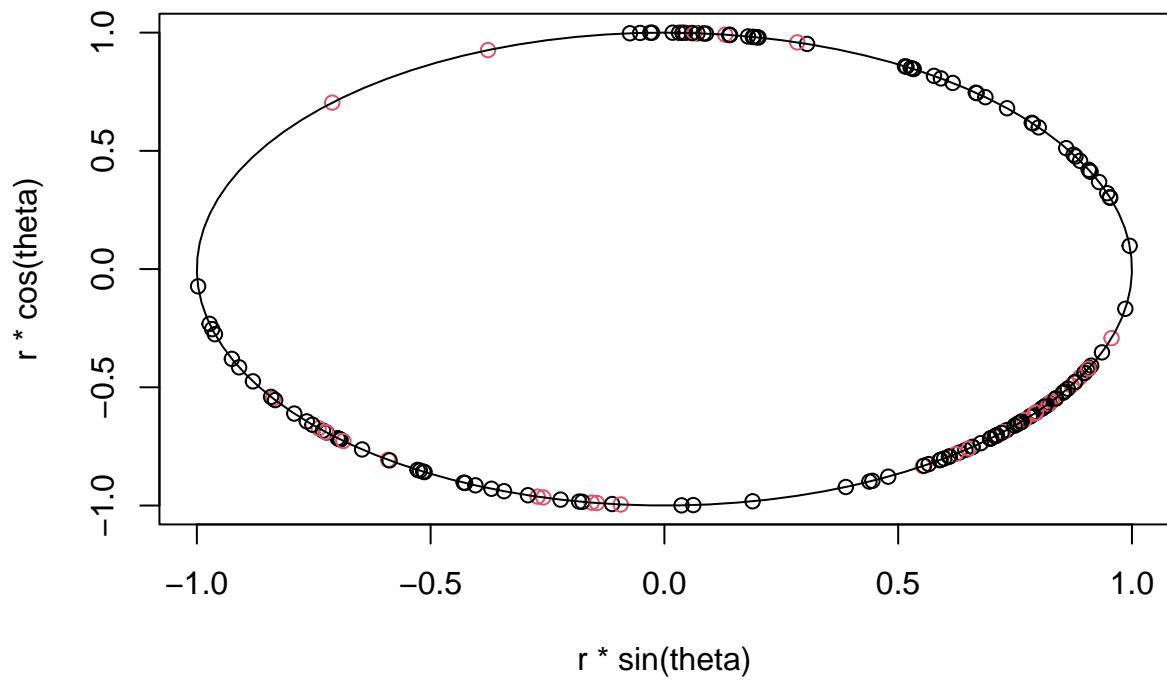


```
## [1] "Iteration 506"
## [1] "Iteration 507"
## [1] "Iteration 508"
## [1] "Iteration 509"
## [1] "Iteration 510"
## [1] "Iteration 510: objective function value is 1.527083"
```

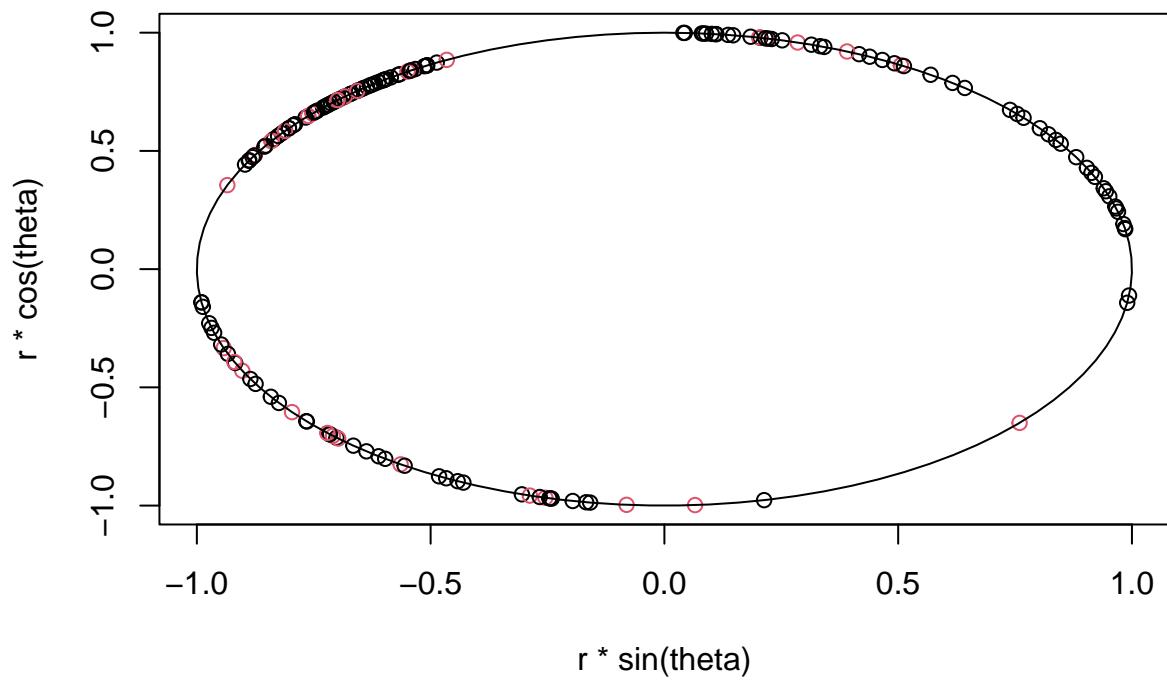


```
## [1] "Iteration 511"
## [1] "Iteration 512"
## [1] "Iteration 513"
## [1] "Iteration 514"
```

```
## [1] "Iteration 515"  
## [1] "Iteration 515: objective function value is 1.520539"
```

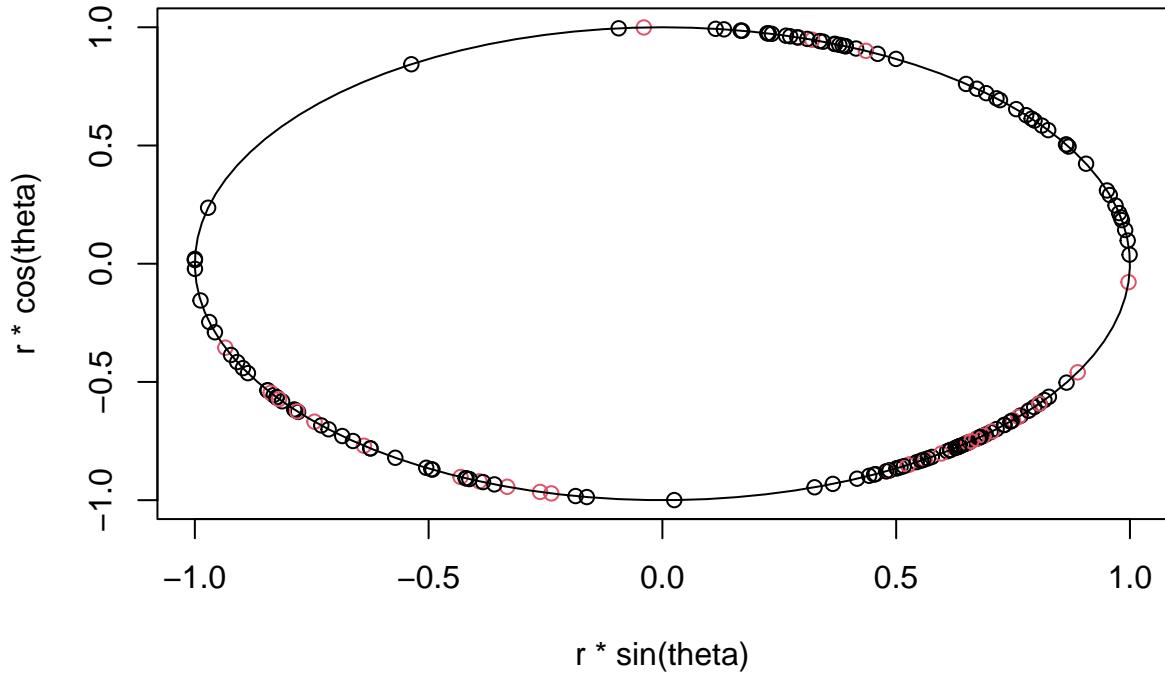


```
## [1] "Iteration 516"  
## [1] "Iteration 517"  
## [1] "Iteration 518"  
## [1] "Iteration 519"  
## [1] "Iteration 520"  
## [1] "Iteration 520: objective function value is 1.525356"
```

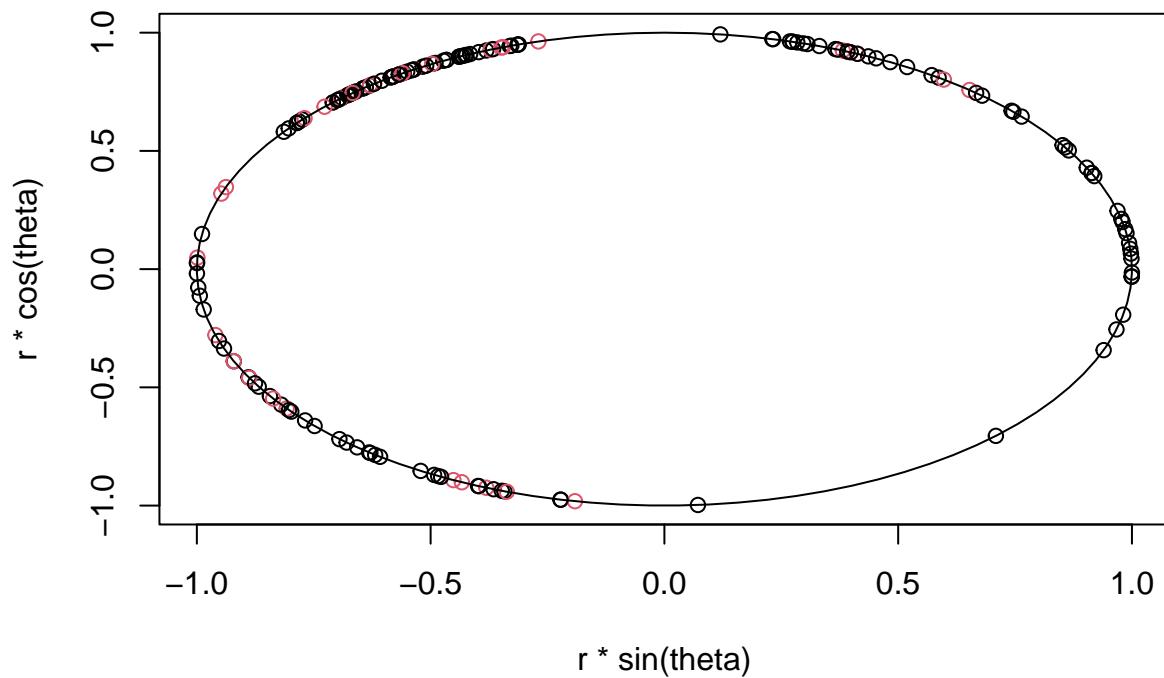


```
## [1] "Iteration 521"
```

```
## [1] "Iteration 522"  
## [1] "Iteration 523"  
## [1] "Iteration 524"  
## [1] "Iteration 525"  
## [1] "Iteration 525: objective function value is 1.520791"
```



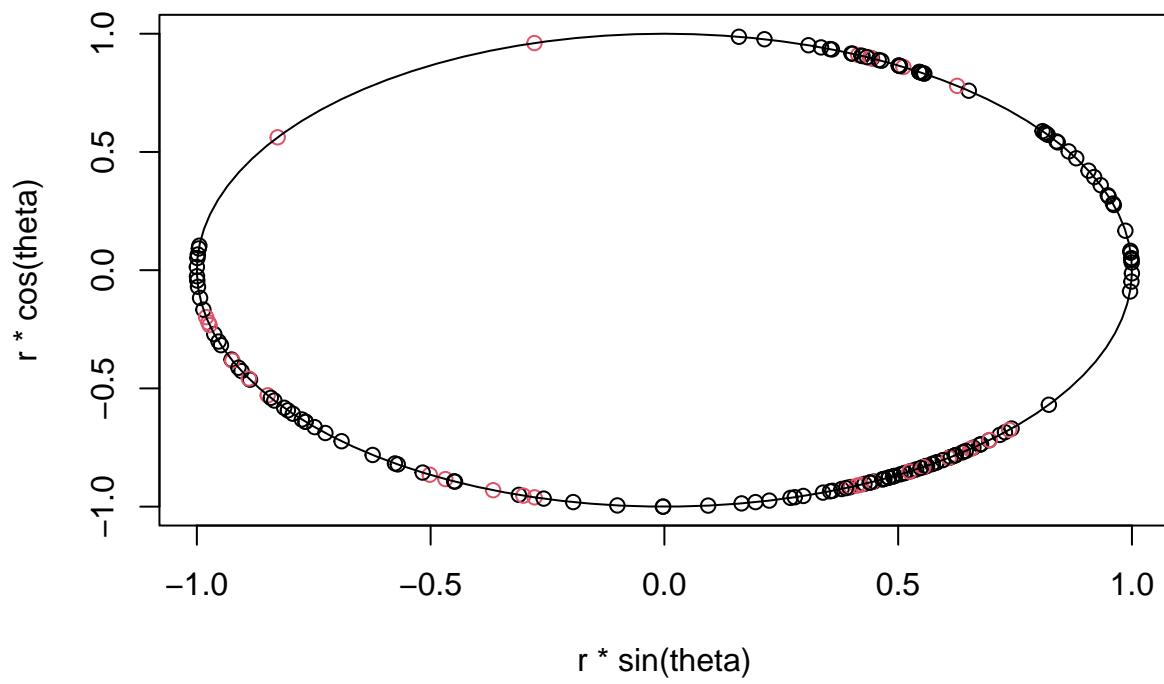
```
## [1] "Iteration 526"  
## [1] "Iteration 527"  
## [1] "Iteration 528"  
## [1] "Iteration 529"  
## [1] "Iteration 530"  
## [1] "Iteration 530: objective function value is 1.517945"
```



```

## [1] "Iteration 531"
## [1] "Iteration 532"
## [1] "Iteration 533"
## [1] "Iteration 534"
## [1] "Iteration 535"
## [1] "Iteration 535: objective function value is 1.512461"

```

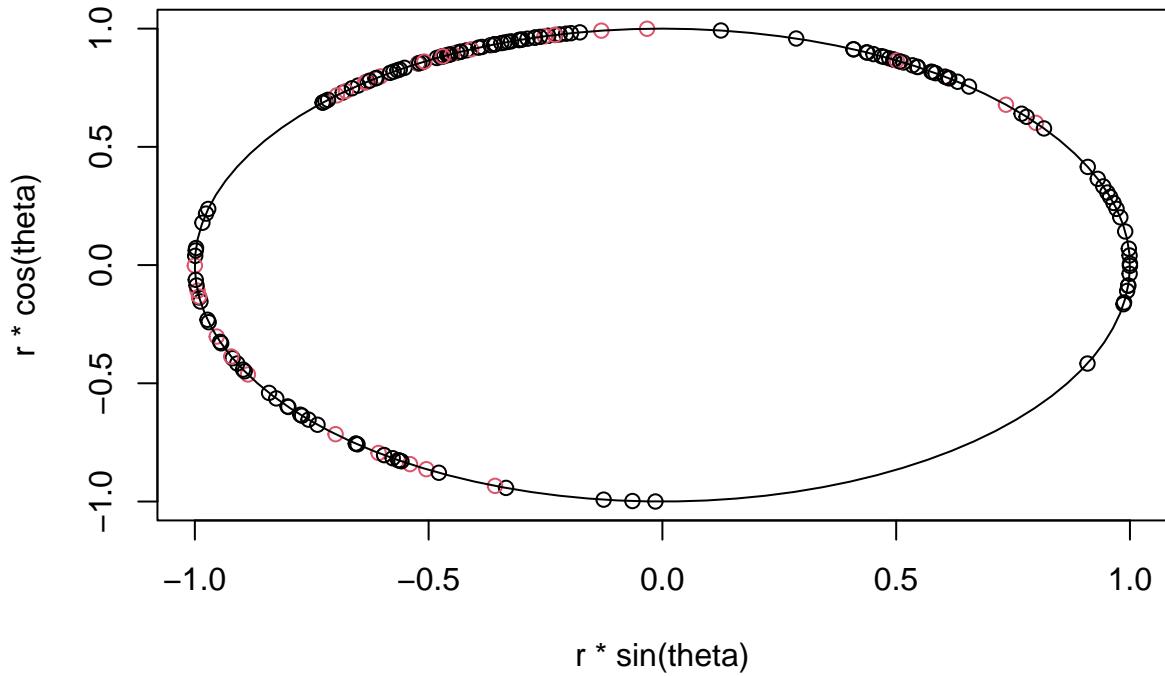


```

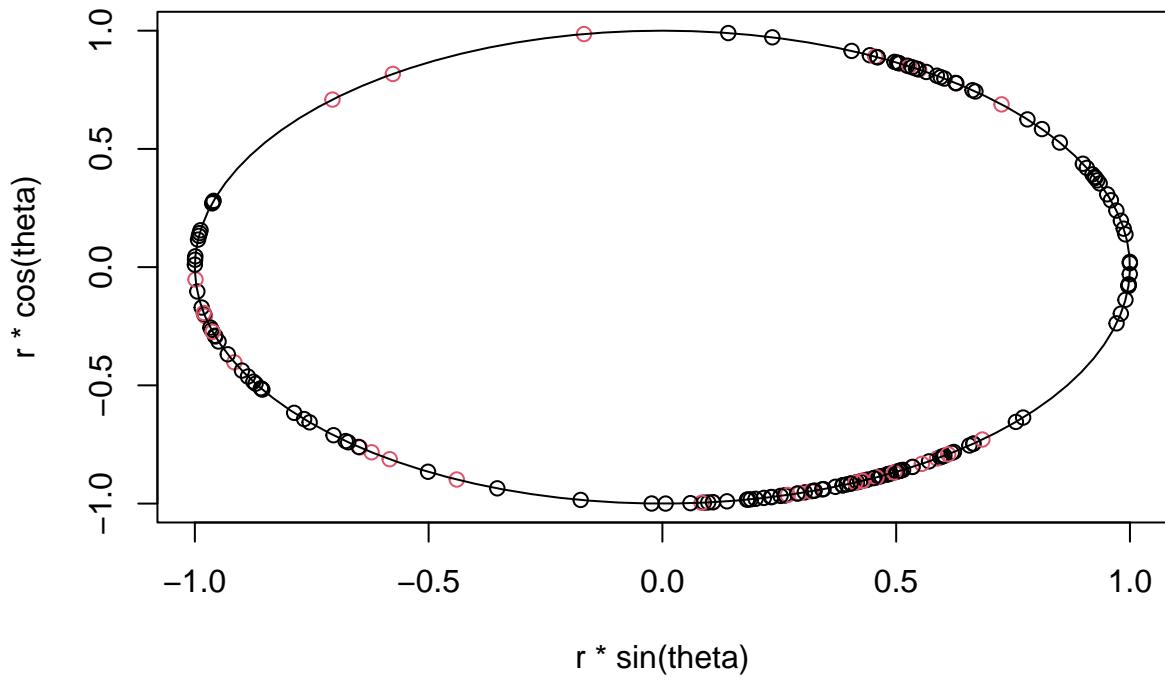
## [1] "Iteration 536"
## [1] "Iteration 537"
## [1] "Iteration 538"
## [1] "Iteration 539"

```

```
## [1] "Iteration 540"  
## [1] "Iteration 540: objective function value is 1.496255"
```

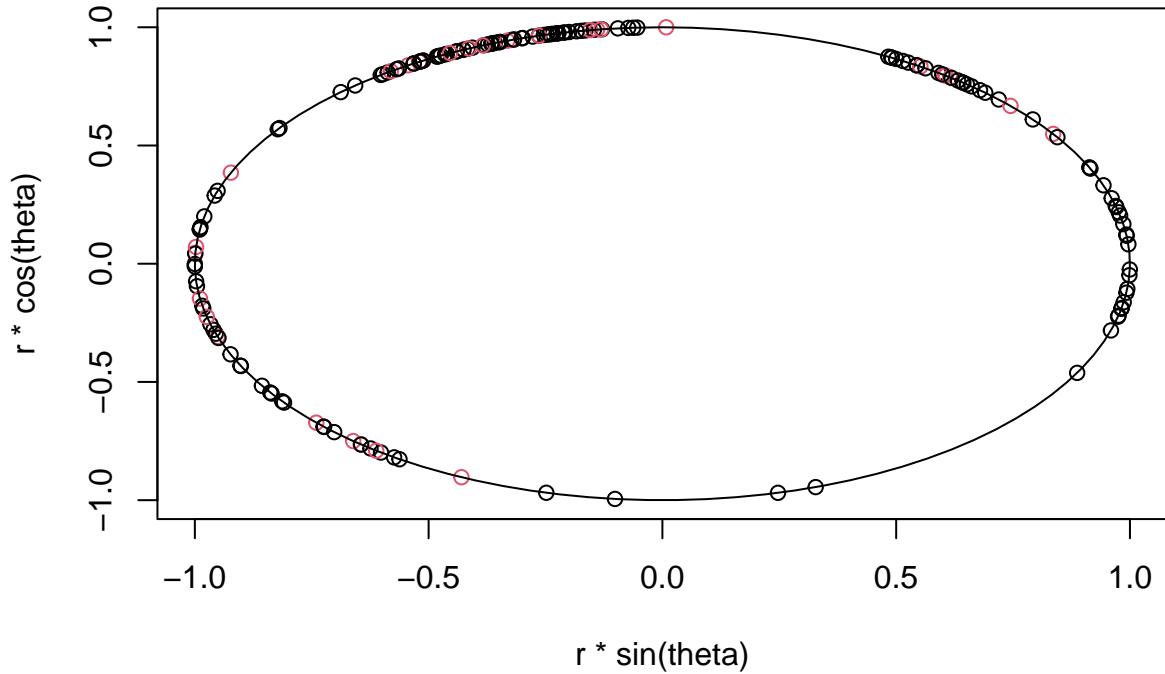


```
## [1] "Iteration 541"  
## [1] "Iteration 542"  
## [1] "Iteration 543"  
## [1] "Iteration 544"  
## [1] "Iteration 545"  
## [1] "Iteration 545: objective function value is 1.530914"
```

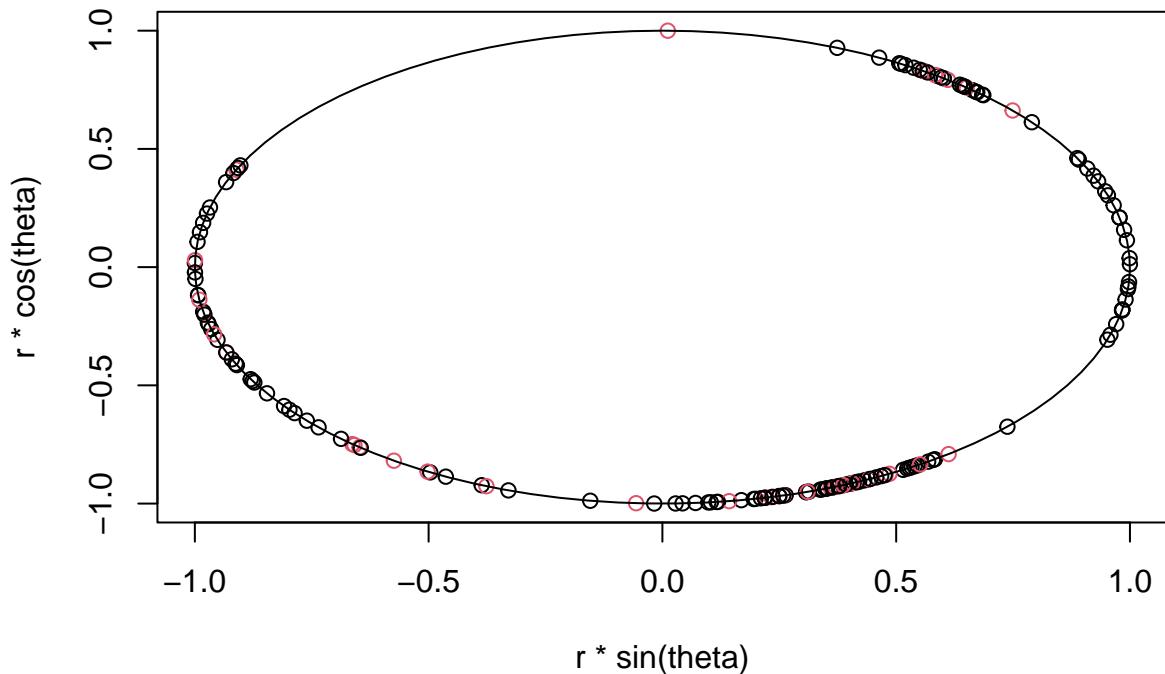


```
## [1] "Iteration 546"
```

```
## [1] "Iteration 547"  
## [1] "Iteration 548"  
## [1] "Iteration 549"  
## [1] "Iteration 550"  
## [1] "Iteration 550: objective function value is 1.538065"
```



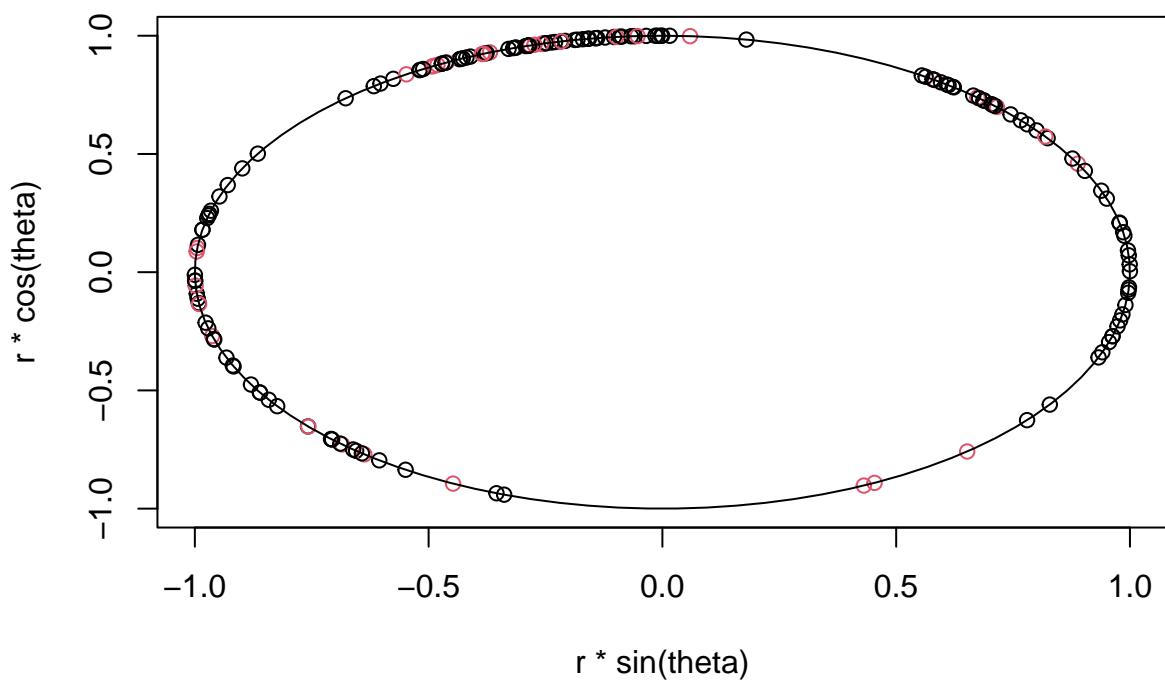
```
## [1] "Iteration 551"  
## [1] "Iteration 552"  
## [1] "Iteration 553"  
## [1] "Iteration 554"  
## [1] "Iteration 555"  
## [1] "Iteration 555: objective function value is 1.504146"
```



```

## [1] "Iteration 556"
## [1] "Iteration 557"
## [1] "Iteration 558"
## [1] "Iteration 559"
## [1] "Iteration 560"
## [1] "Iteration 560: objective function value is 1.512972"

```

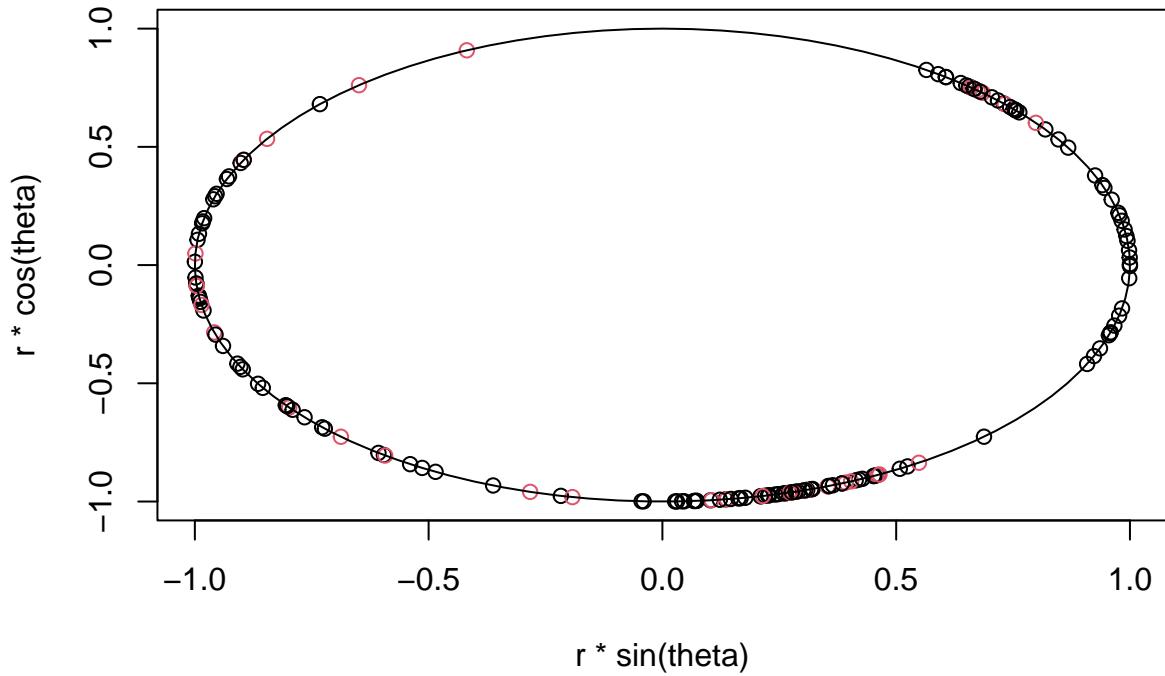


```

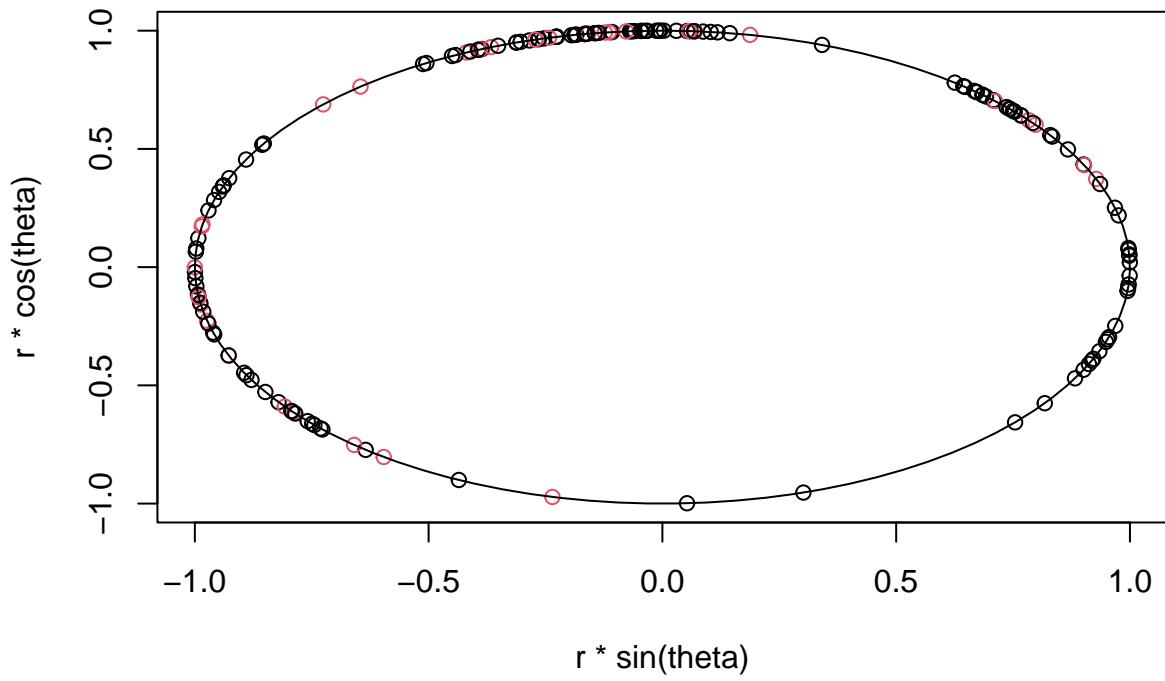
## [1] "Iteration 561"
## [1] "Iteration 562"
## [1] "Iteration 563"
## [1] "Iteration 564"

```

```
## [1] "Iteration 565"  
## [1] "Iteration 565: objective function value is 1.513904"
```

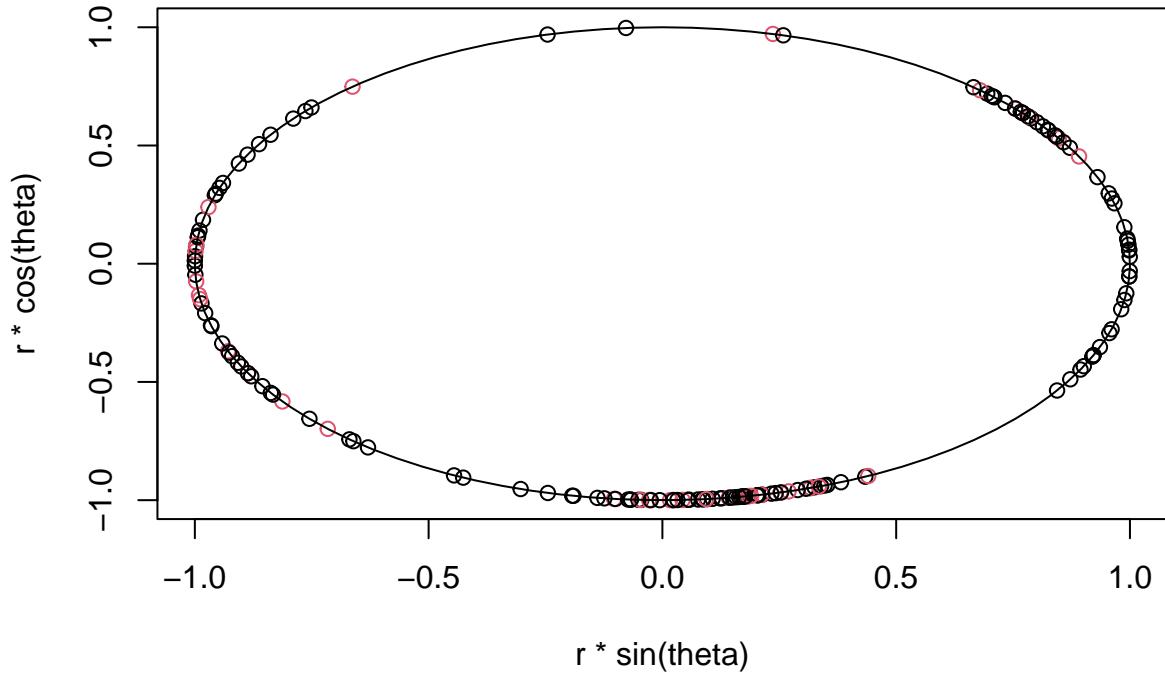


```
## [1] "Iteration 566"  
## [1] "Iteration 567"  
## [1] "Iteration 568"  
## [1] "Iteration 569"  
## [1] "Iteration 570"  
## [1] "Iteration 570: objective function value is 1.513920"
```

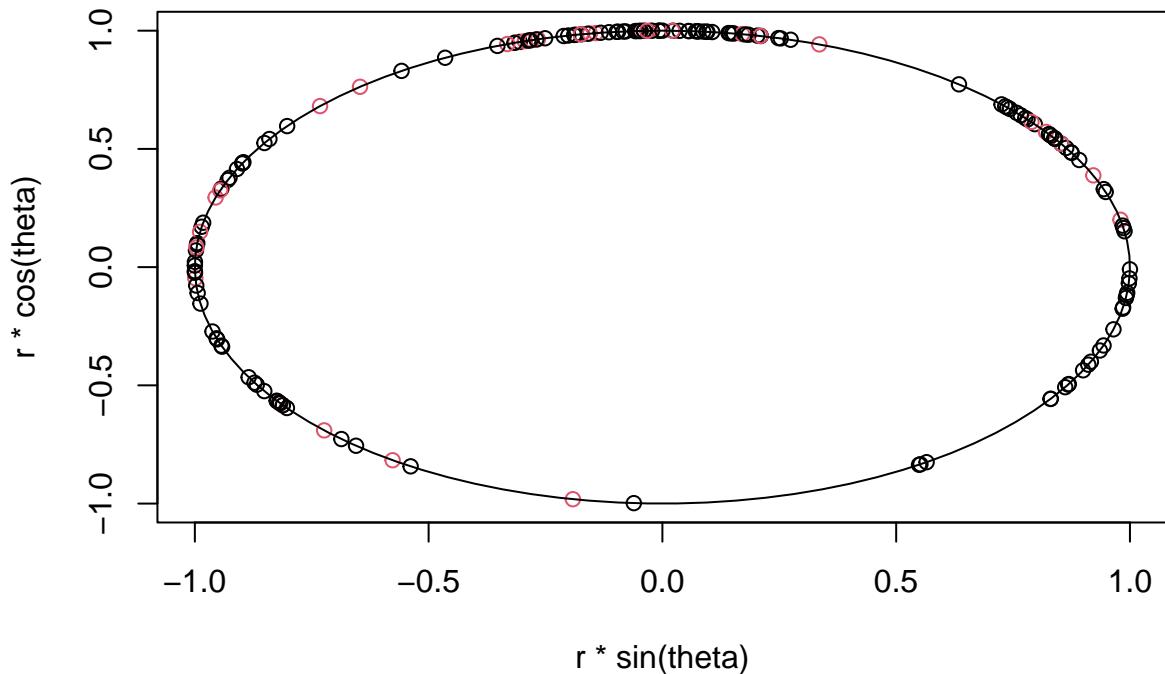


```
## [1] "Iteration 571"
```

```
## [1] "Iteration 572"  
## [1] "Iteration 573"  
## [1] "Iteration 574"  
## [1] "Iteration 575"  
## [1] "Iteration 575: objective function value is 1.520904"
```



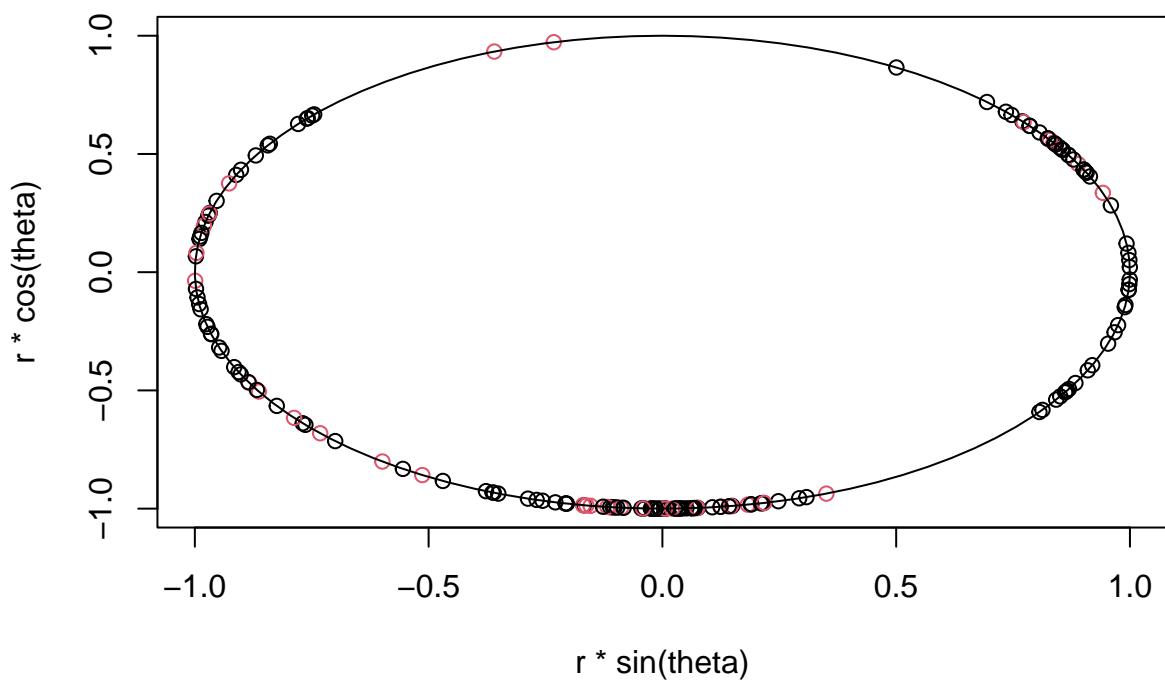
```
## [1] "Iteration 576"  
## [1] "Iteration 577"  
## [1] "Iteration 578"  
## [1] "Iteration 579"  
## [1] "Iteration 580"  
## [1] "Iteration 580: objective function value is 1.492937"
```



```

## [1] "Iteration 581"
## [1] "Iteration 582"
## [1] "Iteration 583"
## [1] "Iteration 584"
## [1] "Iteration 585"
## [1] "Iteration 585: objective function value is 1.500910"

```

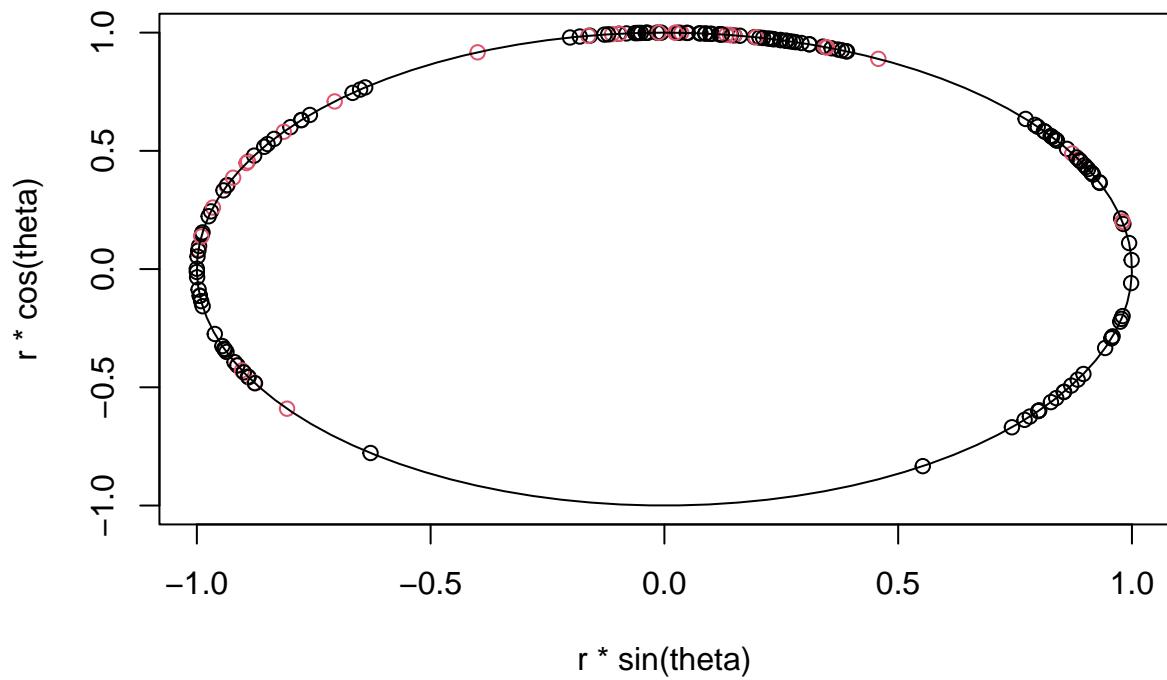


```

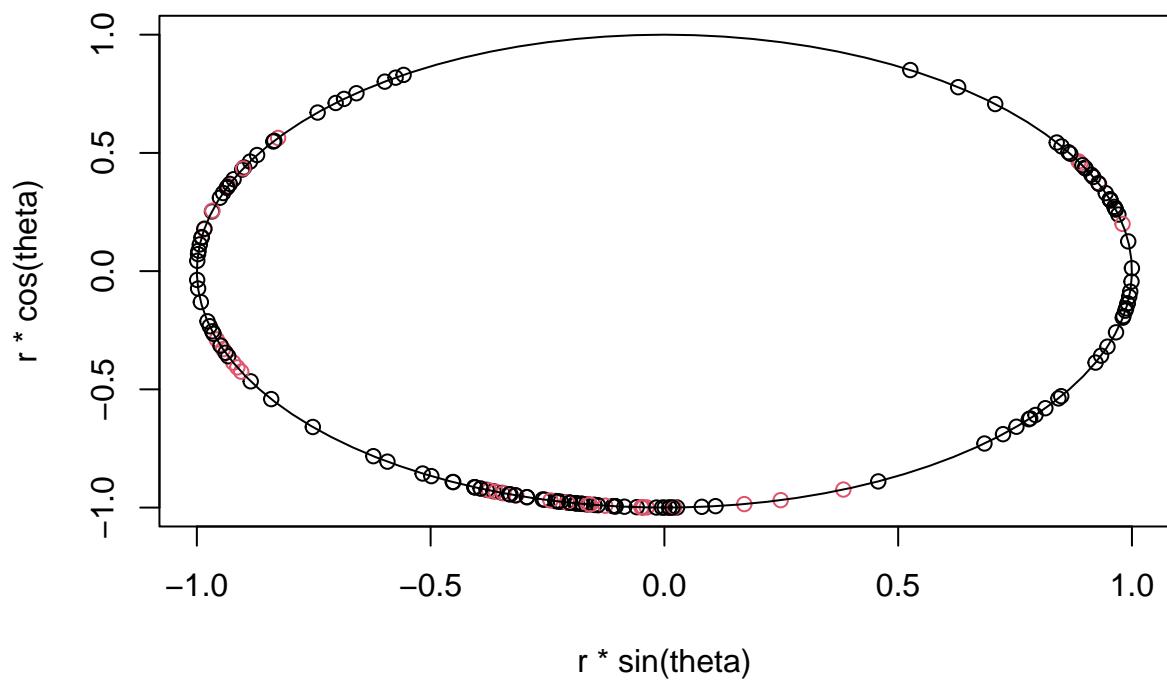
## [1] "Iteration 586"
## [1] "Iteration 587"
## [1] "Iteration 588"
## [1] "Iteration 589"

```

```
## [1] "Iteration 590"  
## [1] "Iteration 590: objective function value is 1.485120"
```

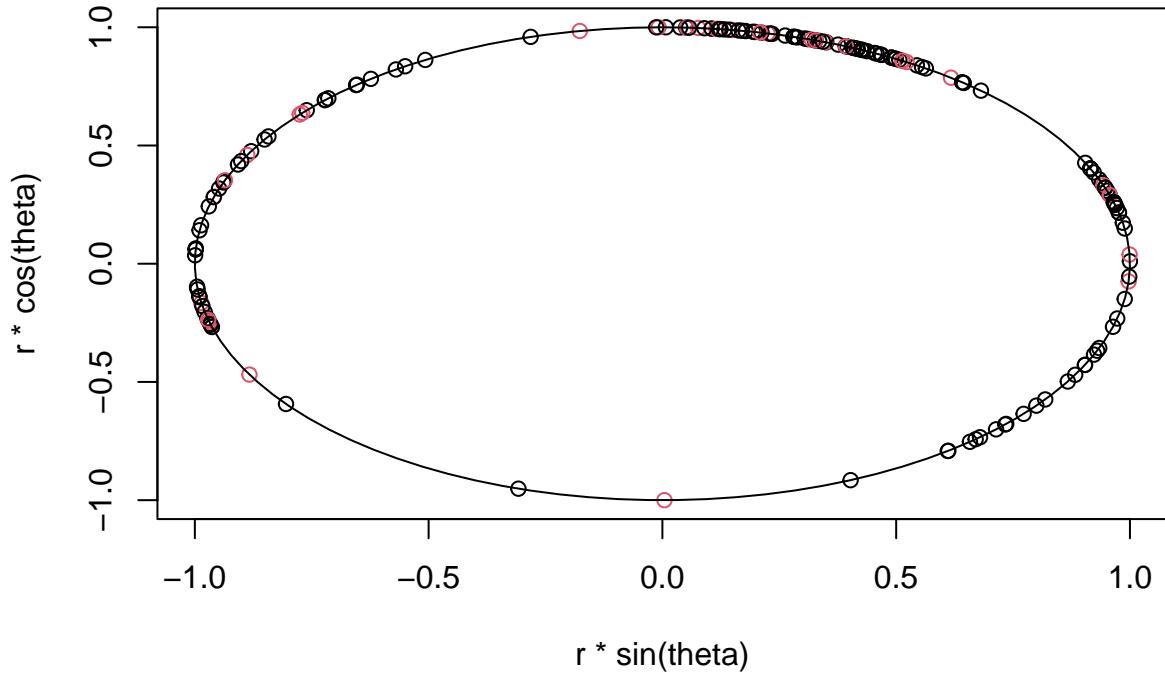


```
## [1] "Iteration 591"  
## [1] "Iteration 592"  
## [1] "Iteration 593"  
## [1] "Iteration 594"  
## [1] "Iteration 595"  
## [1] "Iteration 595: objective function value is 1.521369"
```

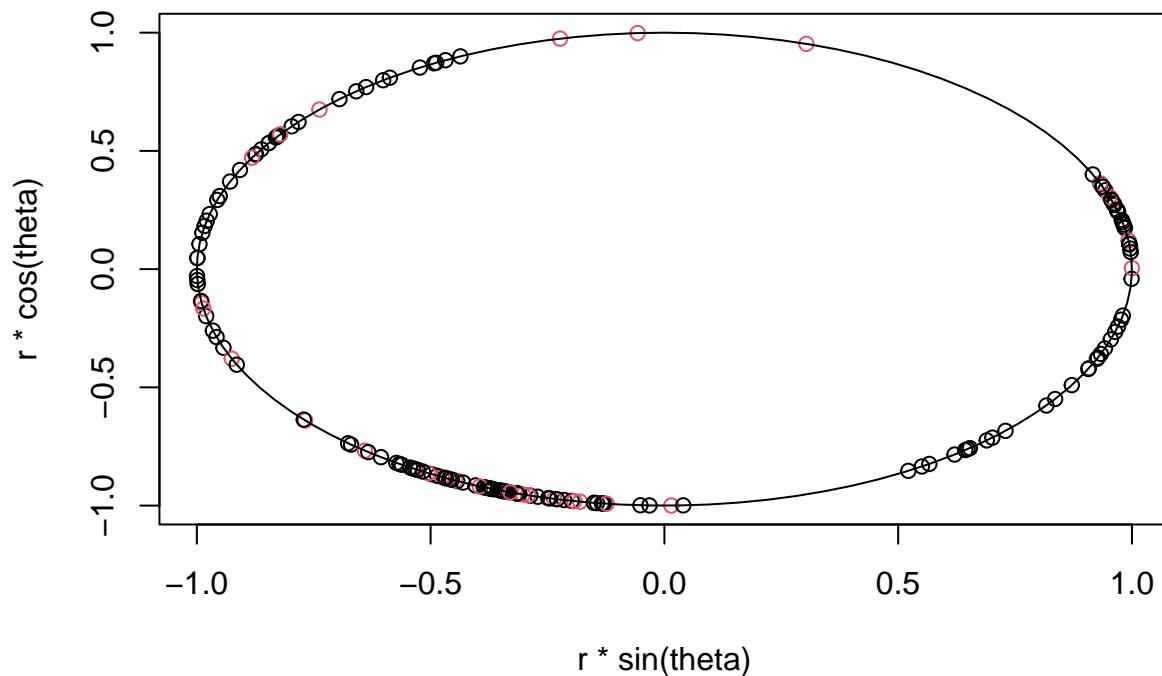


```
## [1] "Iteration 596"
```

```
## [1] "Iteration 597"  
## [1] "Iteration 598"  
## [1] "Iteration 599"  
## [1] "Iteration 600"  
## [1] "Iteration 600: objective function value is 1.501653"
```



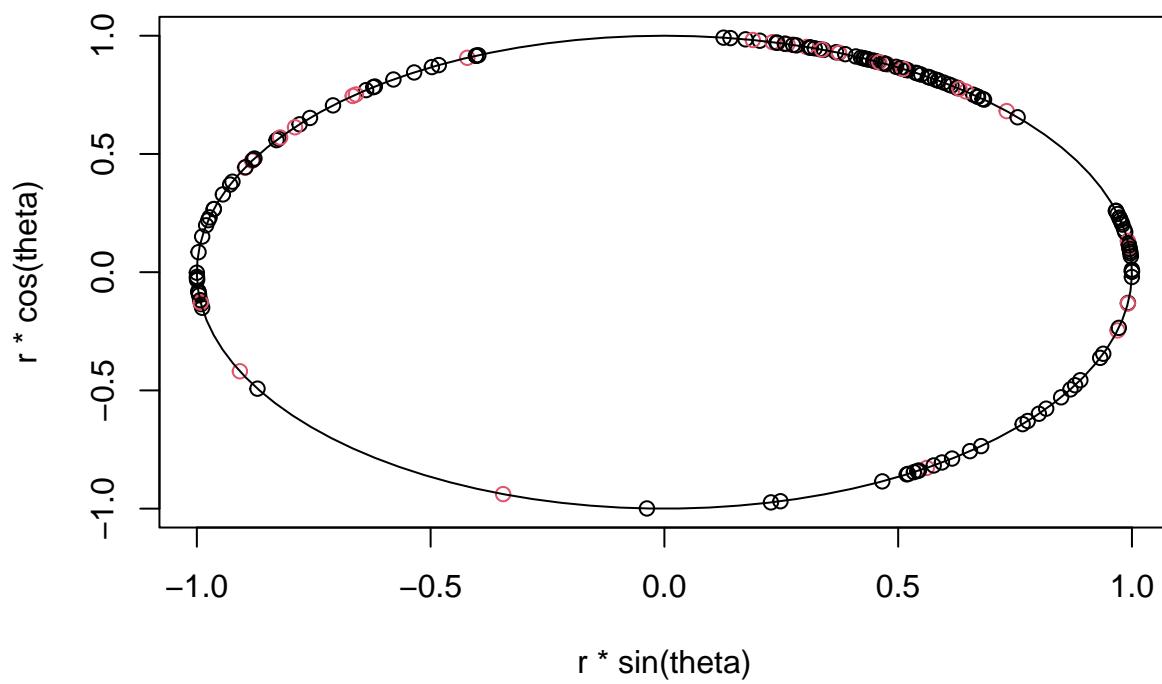
```
## [1] "Iteration 601"  
## [1] "Iteration 602"  
## [1] "Iteration 603"  
## [1] "Iteration 604"  
## [1] "Iteration 605"  
## [1] "Iteration 605: objective function value is 1.514911"
```



```

## [1] "Iteration 606"
## [1] "Iteration 607"
## [1] "Iteration 608"
## [1] "Iteration 609"
## [1] "Iteration 610"
## [1] "Iteration 610: objective function value is 1.508139"

```

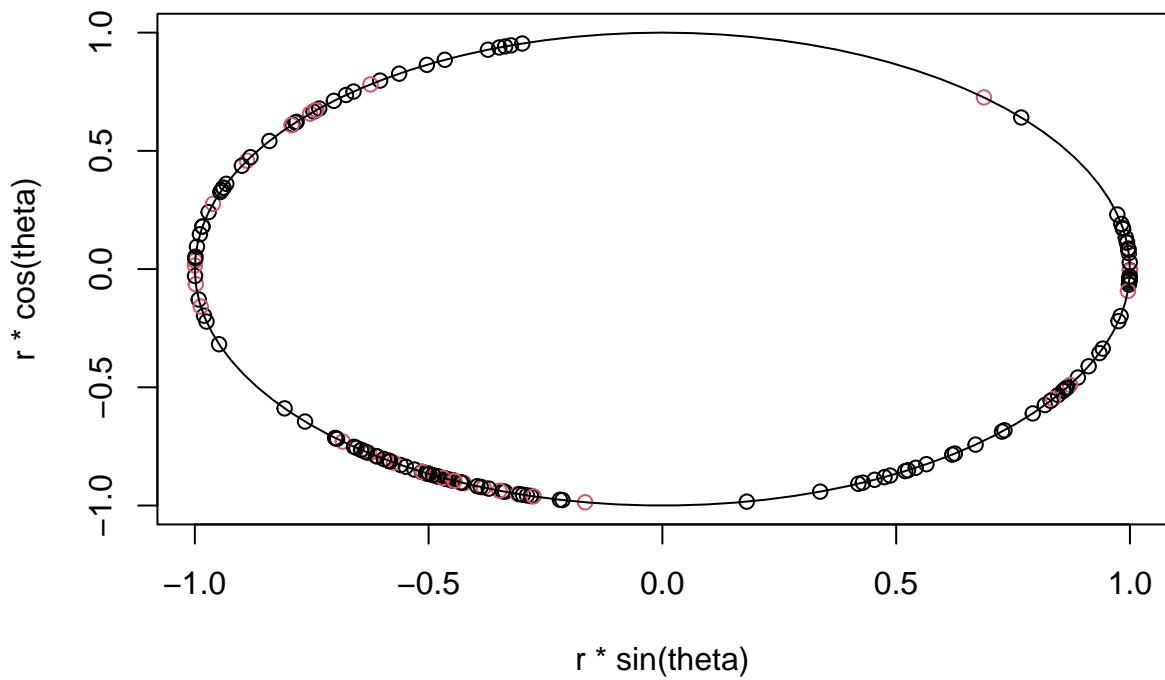


```

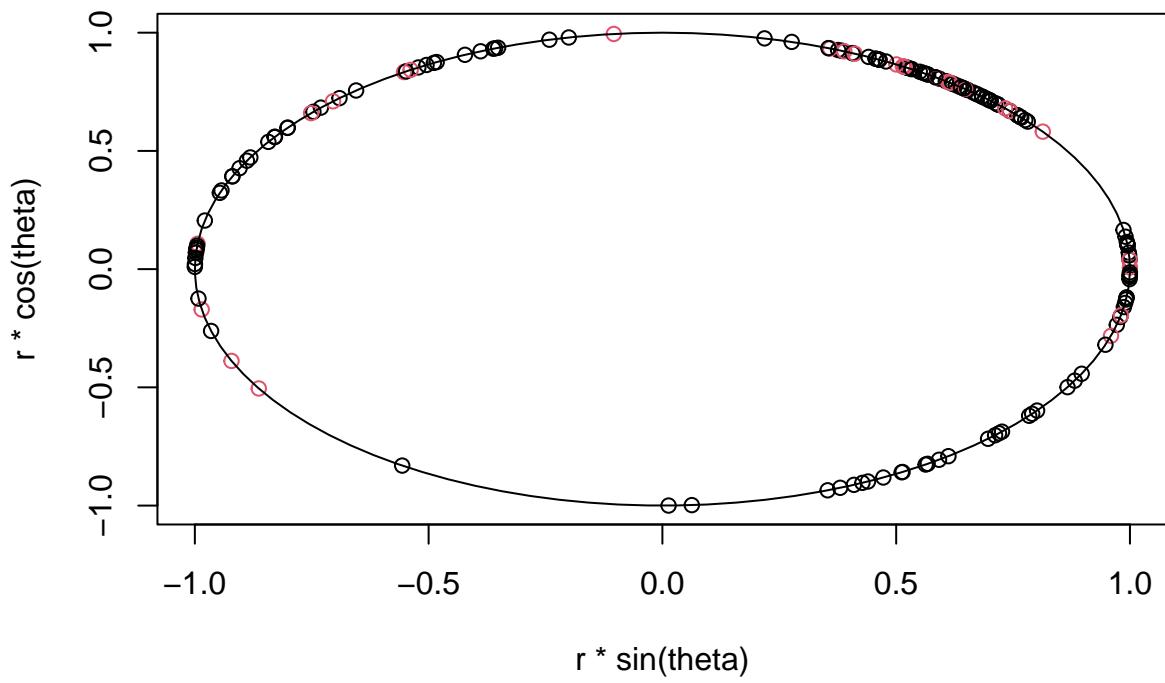
## [1] "Iteration 611"
## [1] "Iteration 612"
## [1] "Iteration 613"
## [1] "Iteration 614"

```

```
## [1] "Iteration 615"  
## [1] "Iteration 615: objective function value is 1.516240"
```

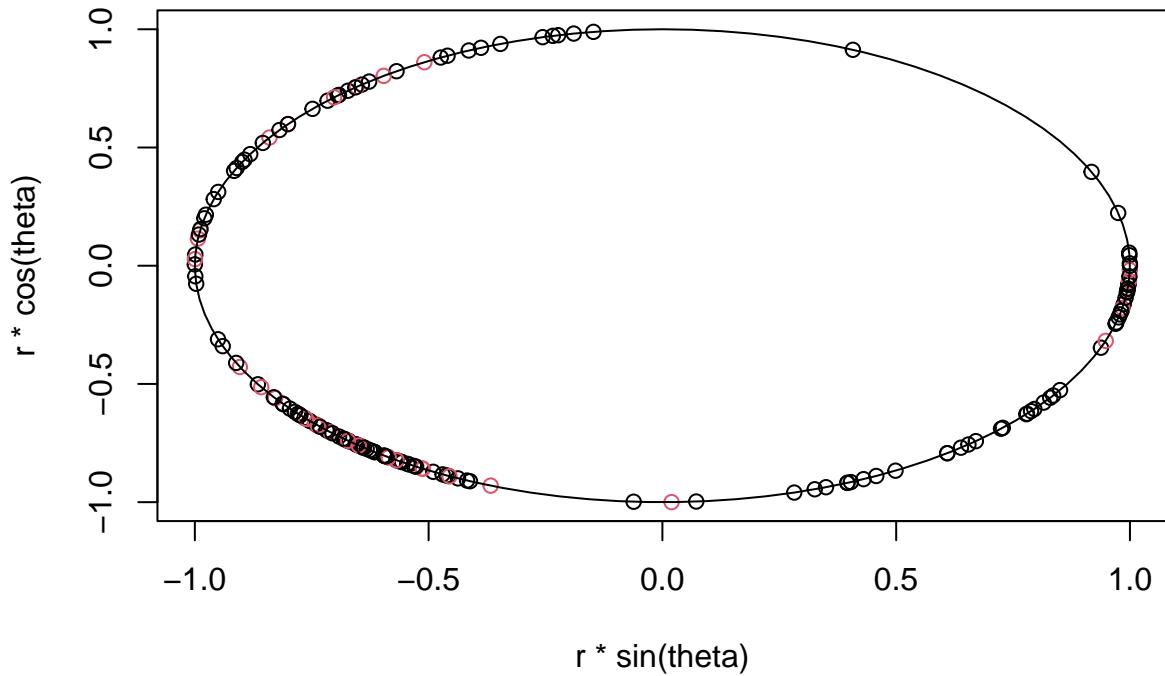


```
## [1] "Iteration 616"  
## [1] "Iteration 617"  
## [1] "Iteration 618"  
## [1] "Iteration 619"  
## [1] "Iteration 620"  
## [1] "Iteration 620: objective function value is 1.506366"
```

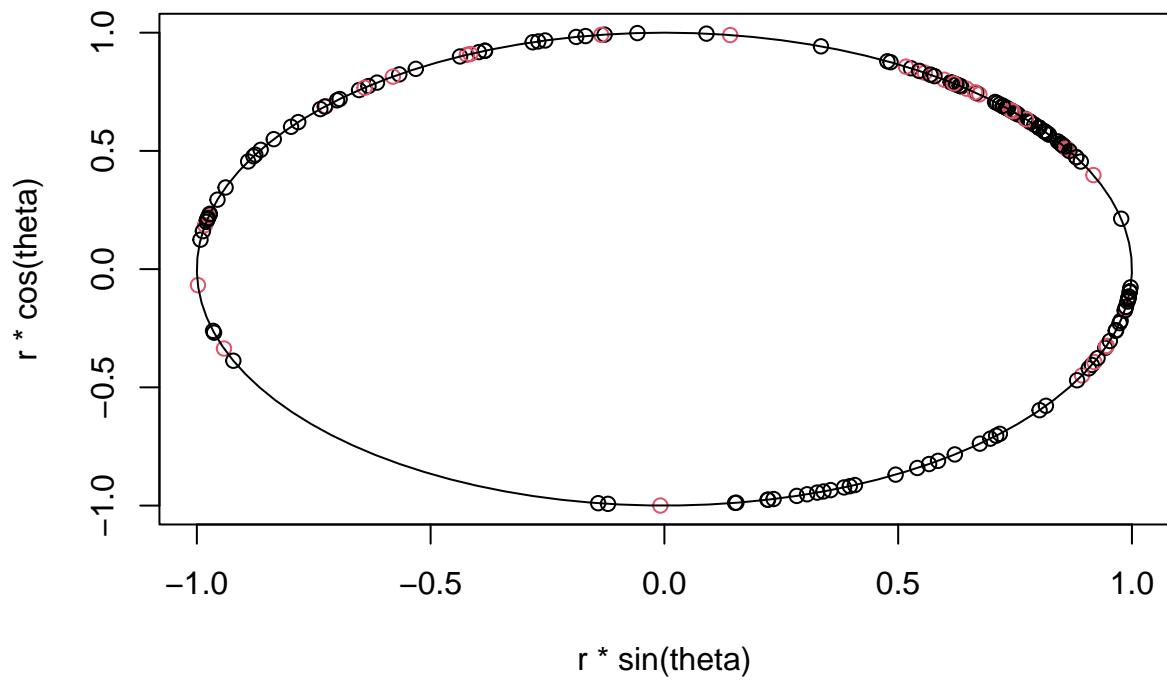


```
## [1] "Iteration 621"
```

```
## [1] "Iteration 622"  
## [1] "Iteration 623"  
## [1] "Iteration 624"  
## [1] "Iteration 625"  
## [1] "Iteration 625: objective function value is 1.505367"
```



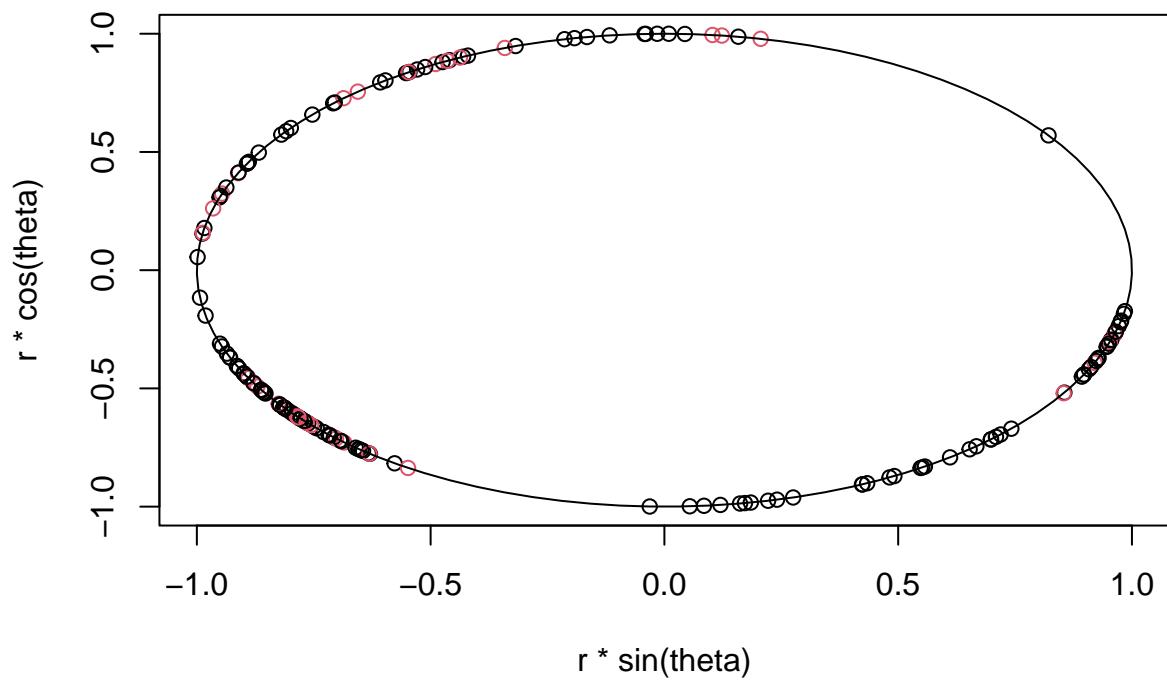
```
## [1] "Iteration 626"  
## [1] "Iteration 627"  
## [1] "Iteration 628"  
## [1] "Iteration 629"  
## [1] "Iteration 630"  
## [1] "Iteration 630: objective function value is 1.518416"
```



```

## [1] "Iteration 631"
## [1] "Iteration 632"
## [1] "Iteration 633"
## [1] "Iteration 634"
## [1] "Iteration 635"
## [1] "Iteration 635: objective function value is 1.519004"

```

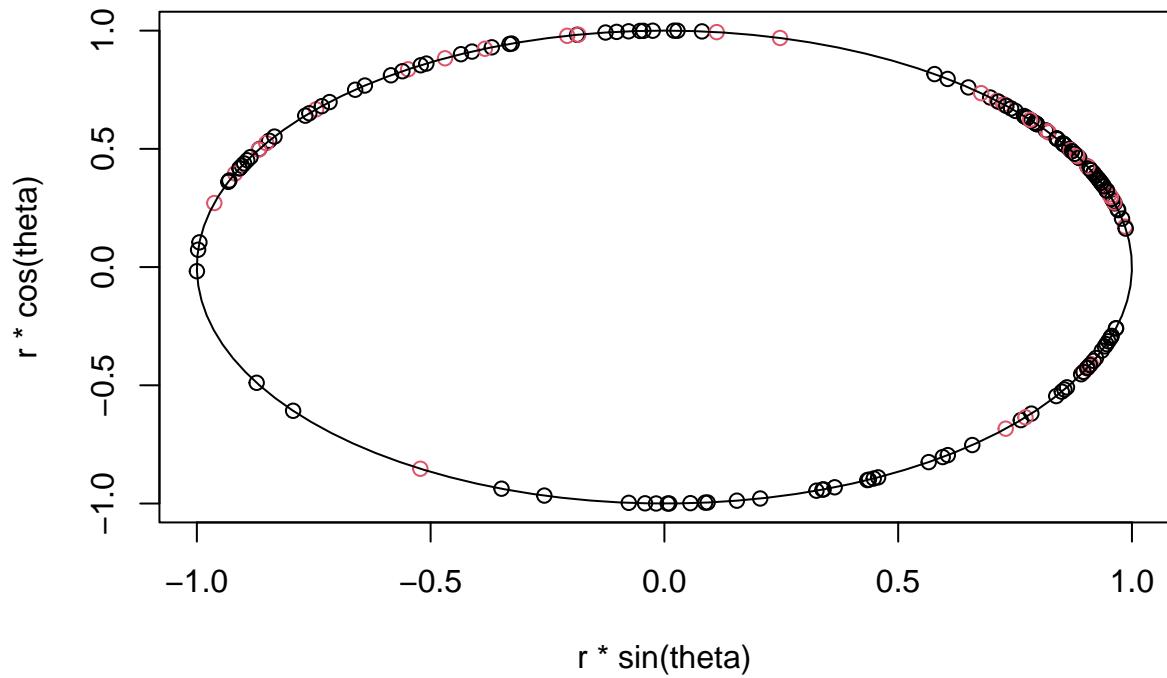


```

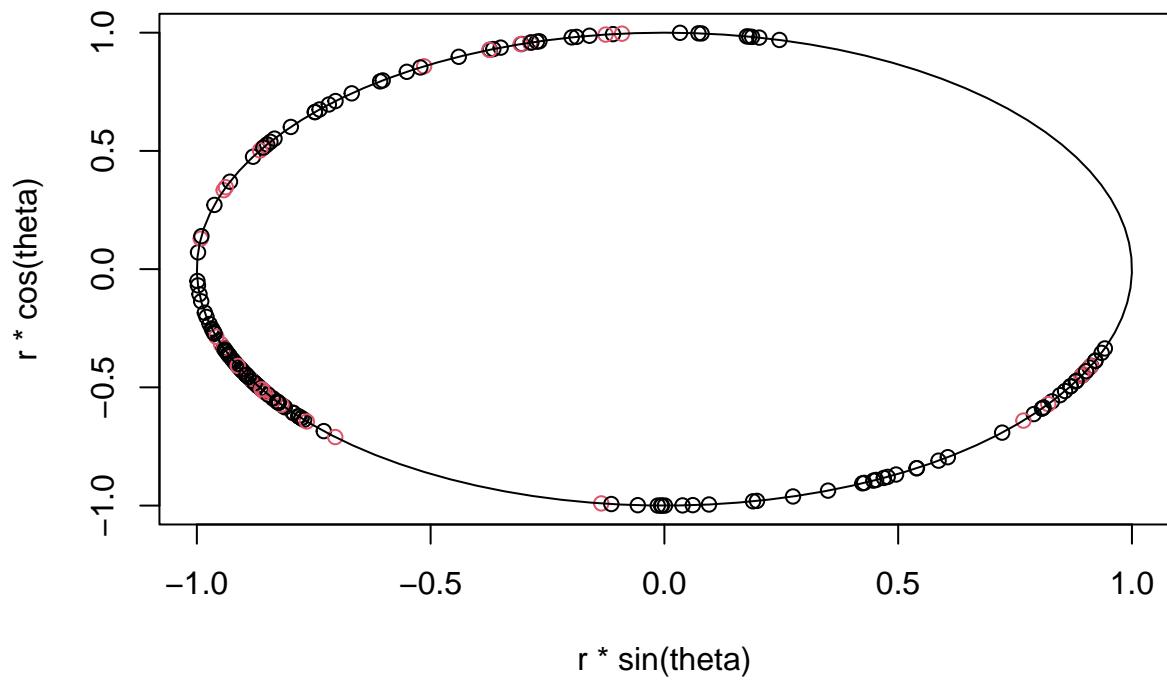
## [1] "Iteration 636"
## [1] "Iteration 637"
## [1] "Iteration 638"
## [1] "Iteration 639"

```

```
## [1] "Iteration 640"  
## [1] "Iteration 640: objective function value is 1.522850"
```

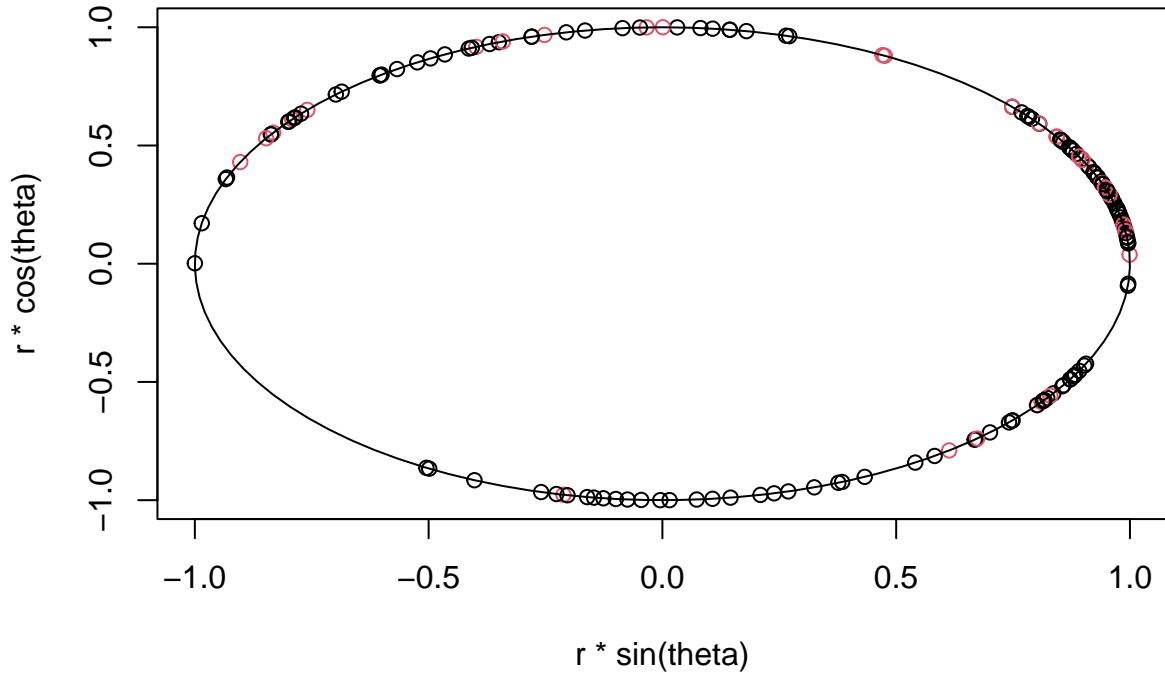


```
## [1] "Iteration 641"  
## [1] "Iteration 642"  
## [1] "Iteration 643"  
## [1] "Iteration 644"  
## [1] "Iteration 645"  
## [1] "Iteration 645: objective function value is 1.518891"
```

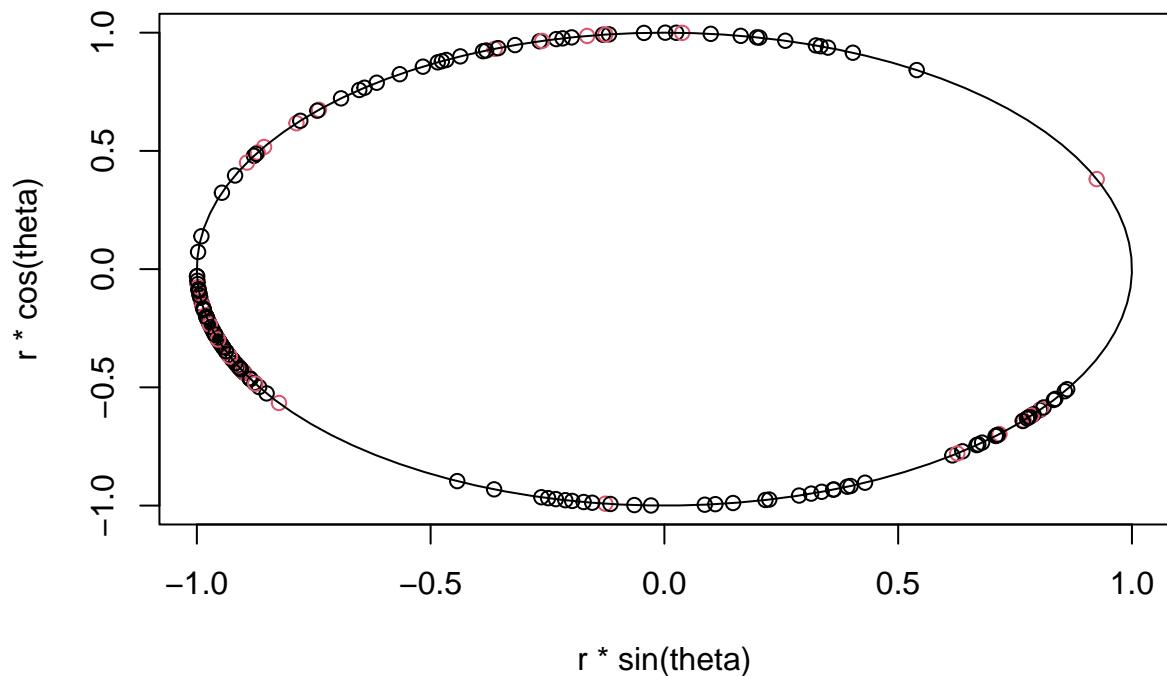


```
## [1] "Iteration 646"
```

```
## [1] "Iteration 647"  
## [1] "Iteration 648"  
## [1] "Iteration 649"  
## [1] "Iteration 650"  
## [1] "Iteration 650: objective function value is 1.505214"
```



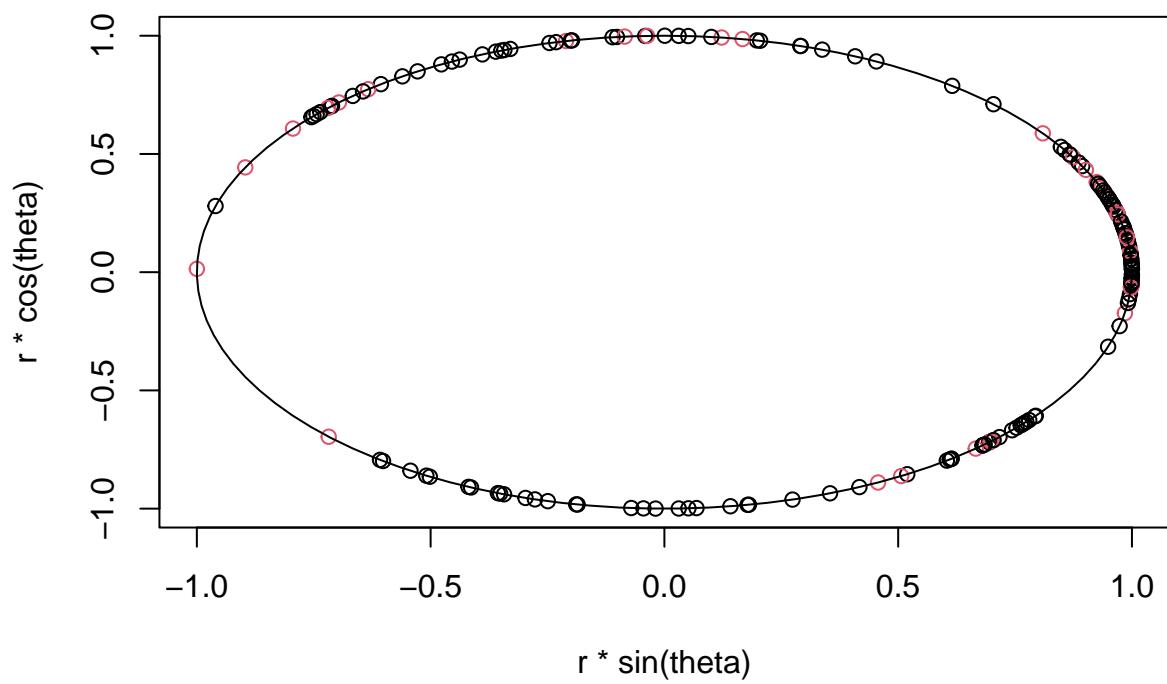
```
## [1] "Iteration 651"  
## [1] "Iteration 652"  
## [1] "Iteration 653"  
## [1] "Iteration 654"  
## [1] "Iteration 655"  
## [1] "Iteration 655: objective function value is 1.524286"
```



```

## [1] "Iteration 656"
## [1] "Iteration 657"
## [1] "Iteration 658"
## [1] "Iteration 659"
## [1] "Iteration 660"
## [1] "Iteration 660: objective function value is 1.507200"

```

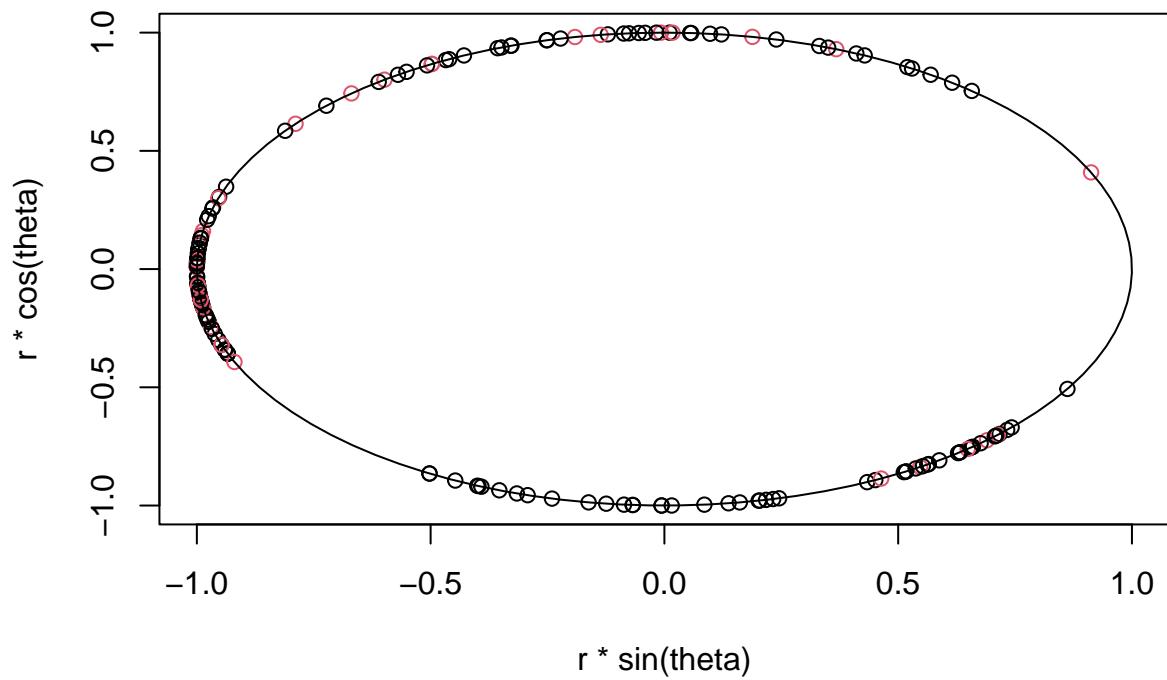


```

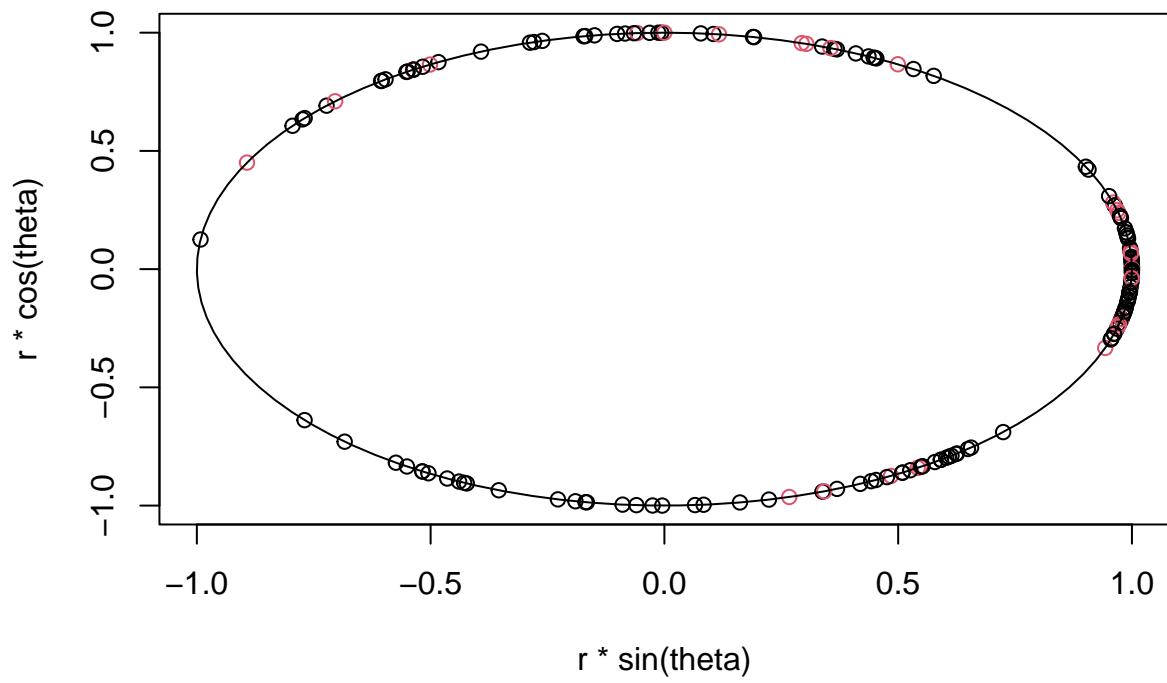
## [1] "Iteration 661"
## [1] "Iteration 662"
## [1] "Iteration 663"
## [1] "Iteration 664"

```

```
## [1] "Iteration 665"  
## [1] "Iteration 665: objective function value is 1.524331"
```

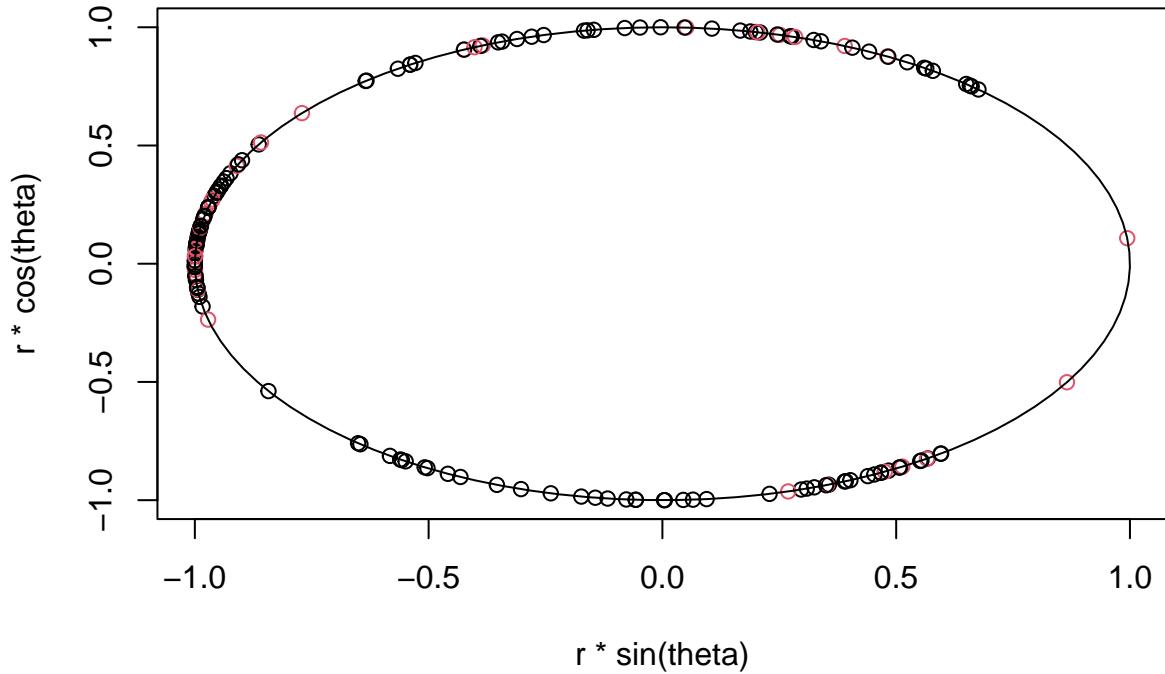


```
## [1] "Iteration 666"  
## [1] "Iteration 667"  
## [1] "Iteration 668"  
## [1] "Iteration 669"  
## [1] "Iteration 670"  
## [1] "Iteration 670: objective function value is 1.513923"
```

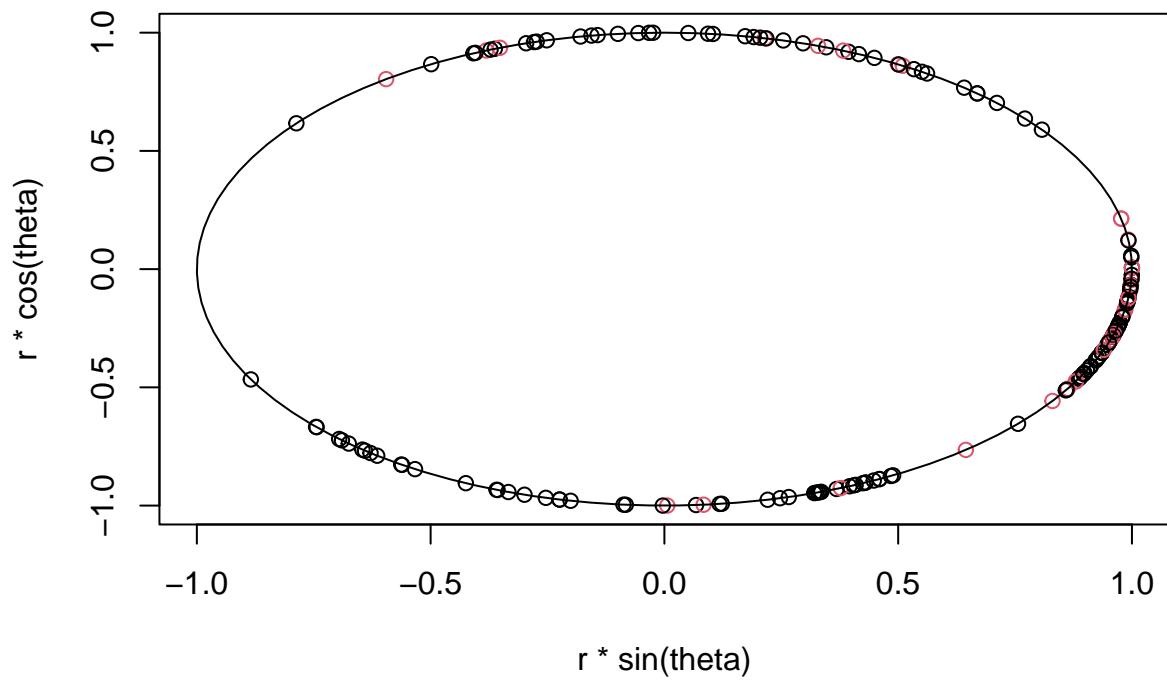


```
## [1] "Iteration 671"
```

```
## [1] "Iteration 672"  
## [1] "Iteration 673"  
## [1] "Iteration 674"  
## [1] "Iteration 675"  
## [1] "Iteration 675: objective function value is 1.521833"
```



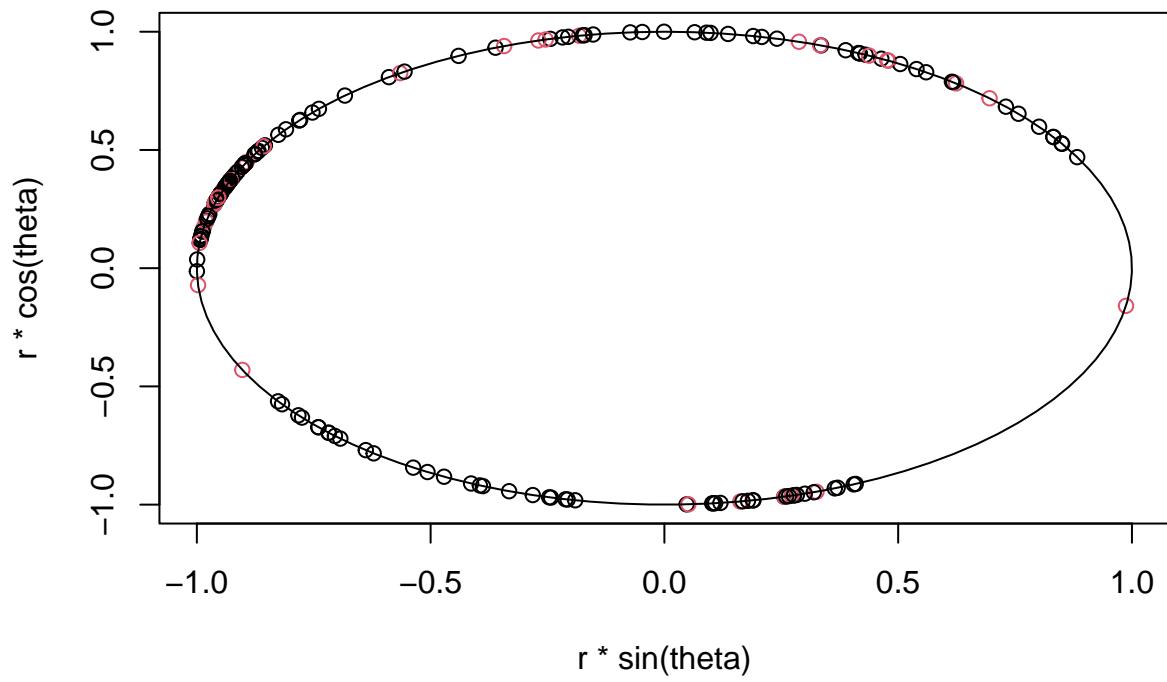
```
## [1] "Iteration 676"  
## [1] "Iteration 677"  
## [1] "Iteration 678"  
## [1] "Iteration 679"  
## [1] "Iteration 680"  
## [1] "Iteration 680: objective function value is 1.514079"
```



```

## [1] "Iteration 681"
## [1] "Iteration 682"
## [1] "Iteration 683"
## [1] "Iteration 684"
## [1] "Iteration 685"
## [1] "Iteration 685: objective function value is 1.507434"

```

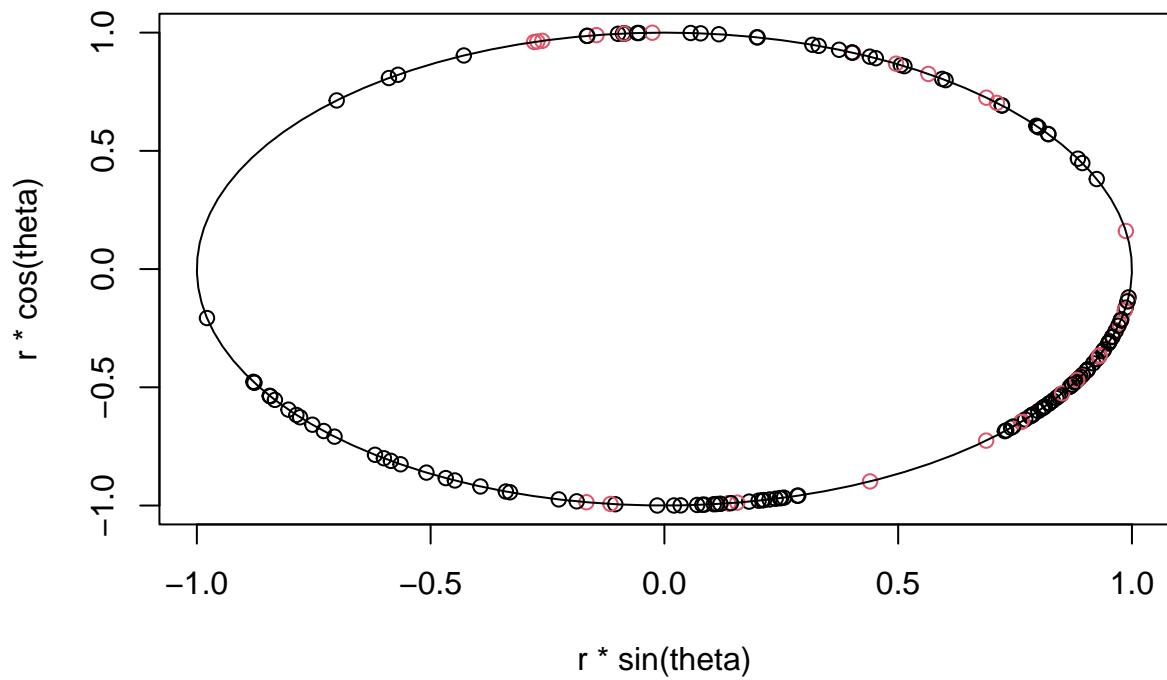


```

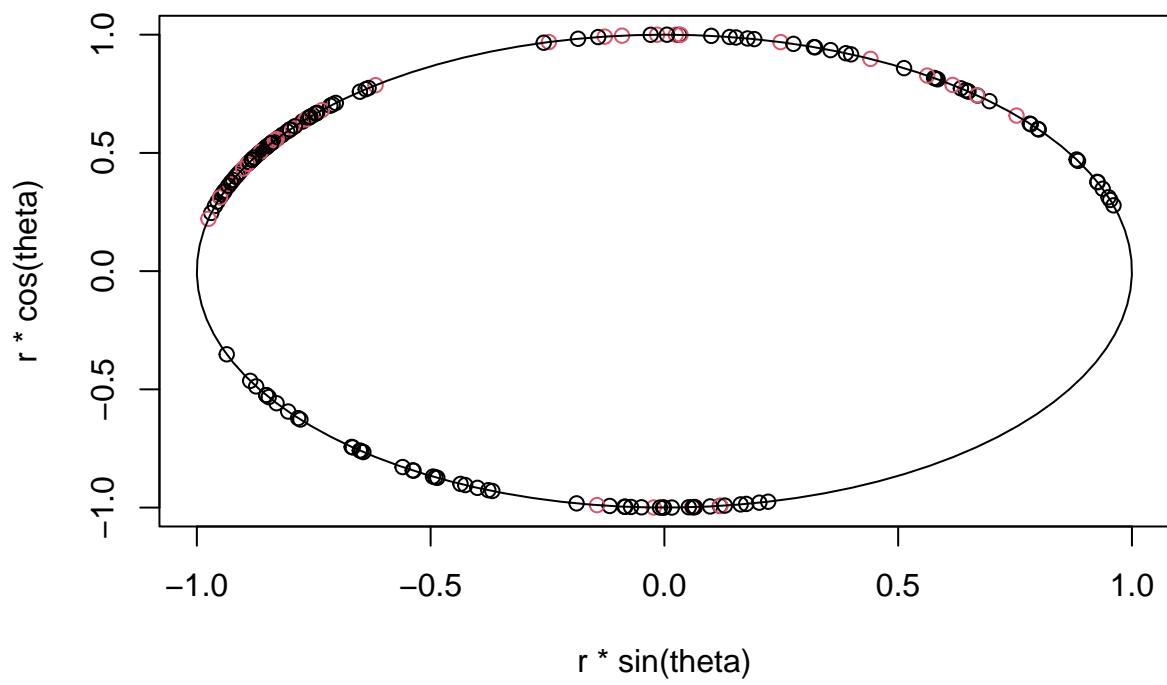
## [1] "Iteration 686"
## [1] "Iteration 687"
## [1] "Iteration 688"
## [1] "Iteration 689"

```

```
## [1] "Iteration 690"  
## [1] "Iteration 690: objective function value is 1.513318"
```

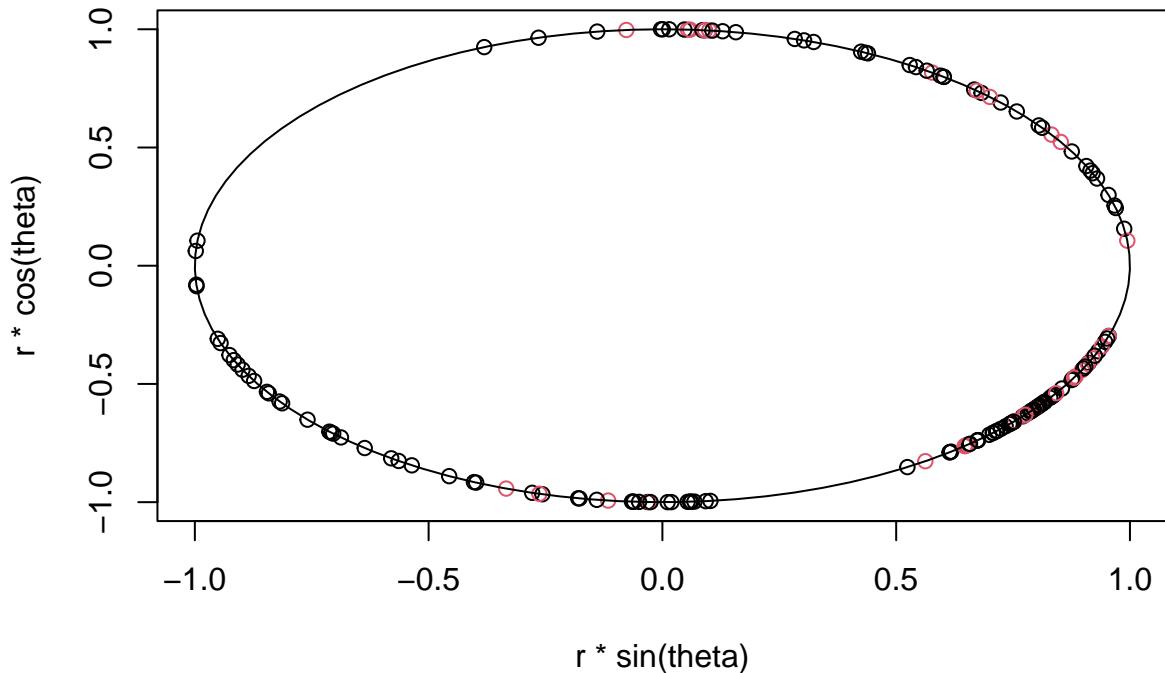


```
## [1] "Iteration 691"  
## [1] "Iteration 692"  
## [1] "Iteration 693"  
## [1] "Iteration 694"  
## [1] "Iteration 695"  
## [1] "Iteration 695: objective function value is 1.523609"
```

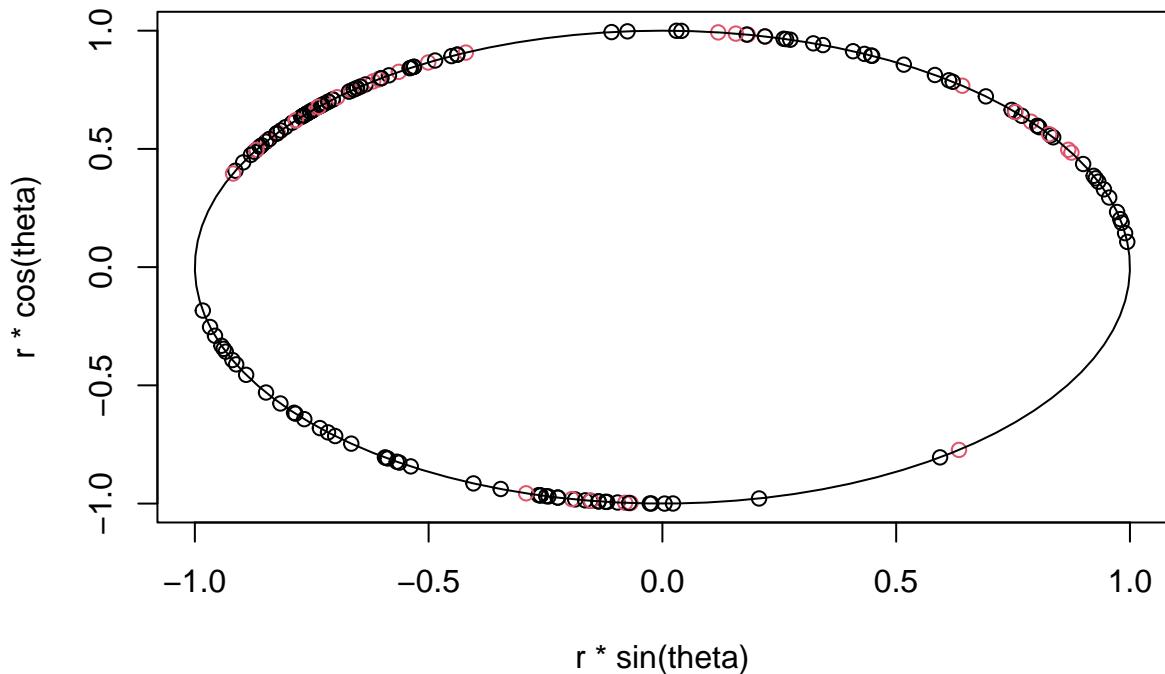


```
## [1] "Iteration 696"
```

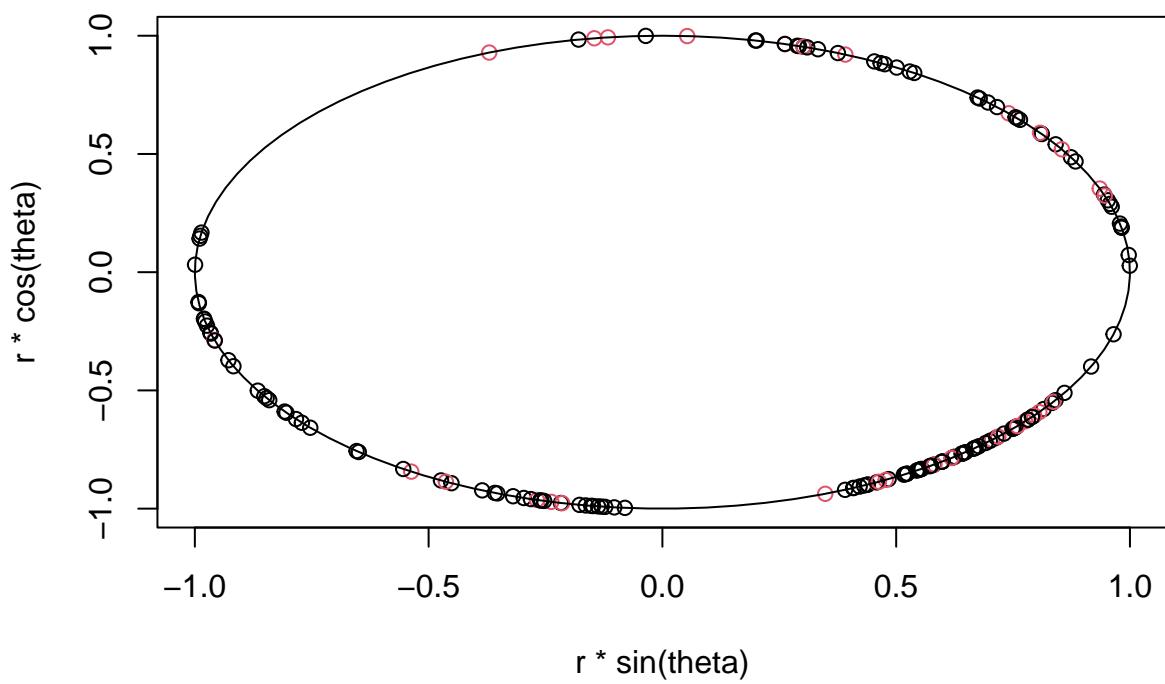
```
## [1] "Iteration 697"  
## [1] "Iteration 698"  
## [1] "Iteration 699"  
## [1] "Iteration 700"  
## [1] "Iteration 700: objective function value is 1.508847"
```



```
## [1] "Iteration 701"  
## [1] "Iteration 702"  
## [1] "Iteration 703"  
## [1] "Iteration 704"  
## [1] "Iteration 705"  
## [1] "Iteration 705: objective function value is 1.526548"
```

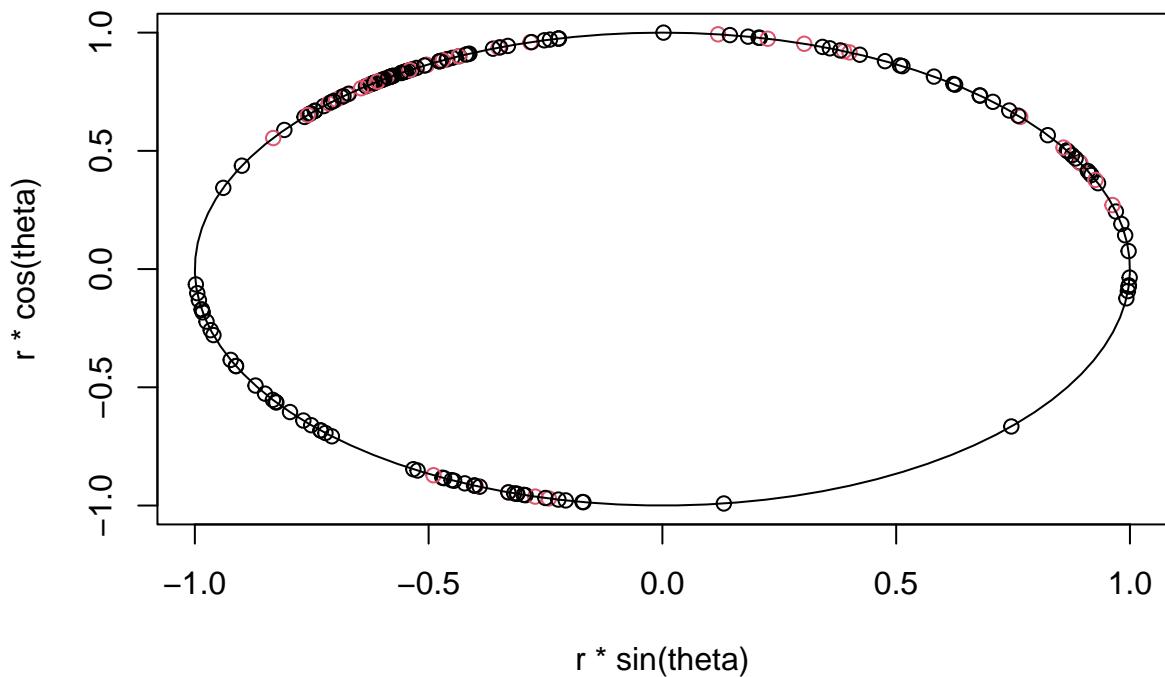


```
## [1] "Iteration 706"
## [1] "Iteration 707"
## [1] "Iteration 708"
## [1] "Iteration 709"
## [1] "Iteration 710"
## [1] "Iteration 710: objective function value is 1.528476"
```

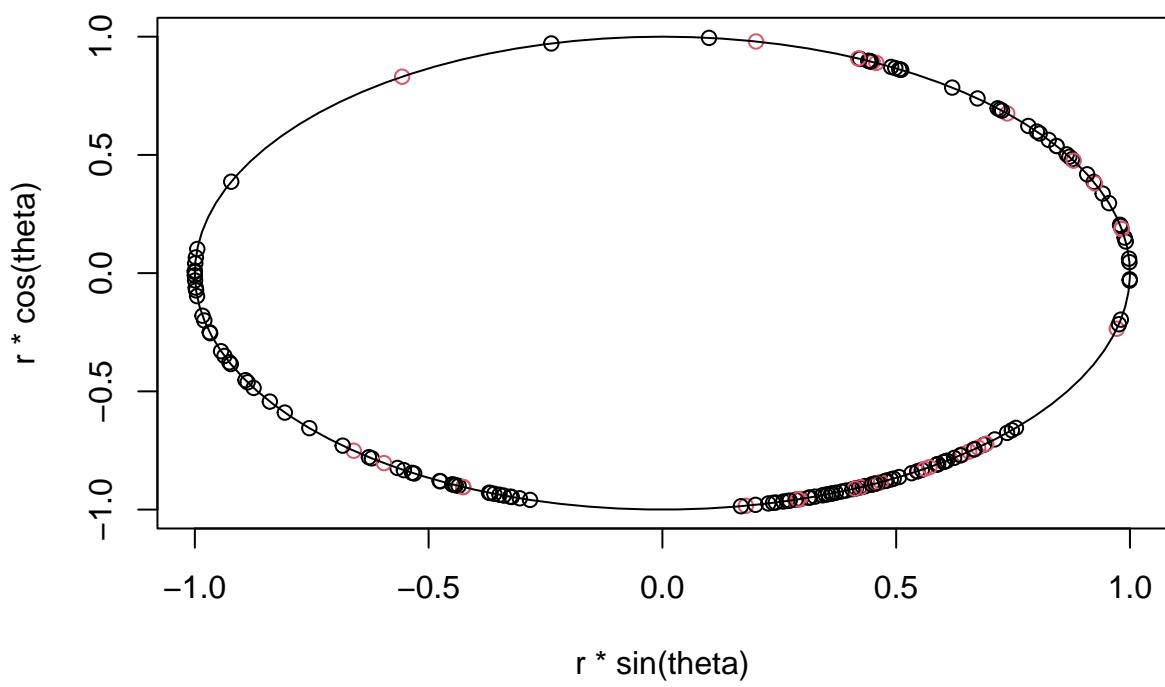


```
## [1] "Iteration 711"
## [1] "Iteration 712"
## [1] "Iteration 713"
## [1] "Iteration 714"
```

```
## [1] "Iteration 715"  
## [1] "Iteration 715: objective function value is 1.505654"
```

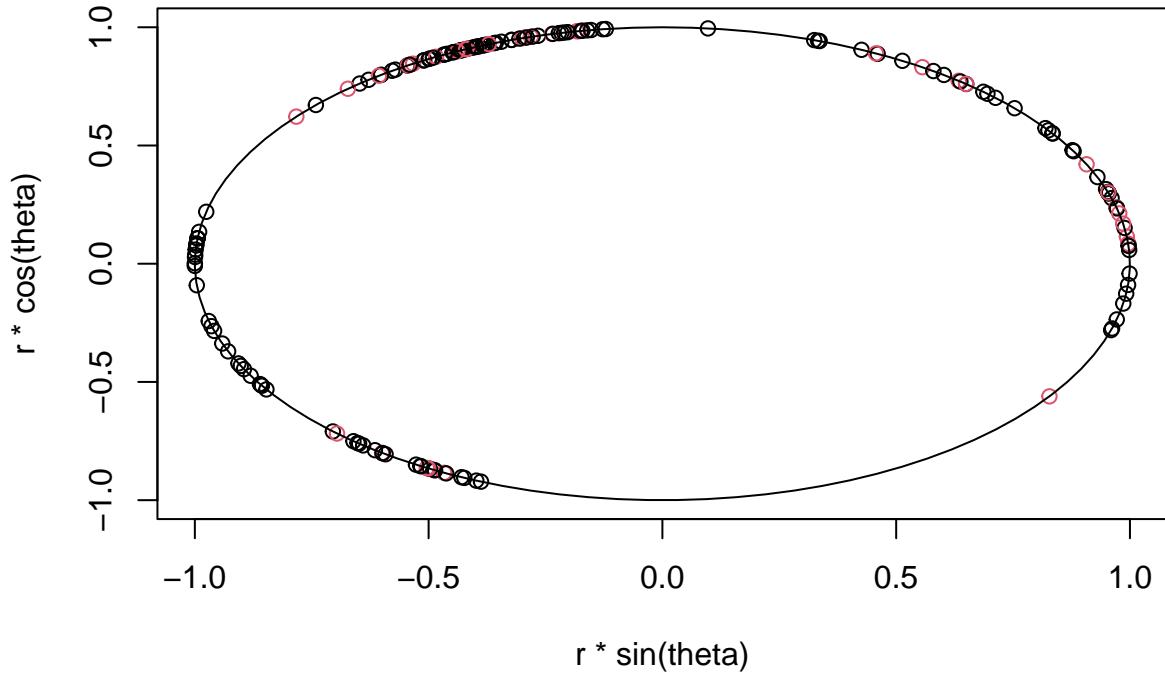


```
## [1] "Iteration 716"  
## [1] "Iteration 717"  
## [1] "Iteration 718"  
## [1] "Iteration 719"  
## [1] "Iteration 720"  
## [1] "Iteration 720: objective function value is 1.511383"
```

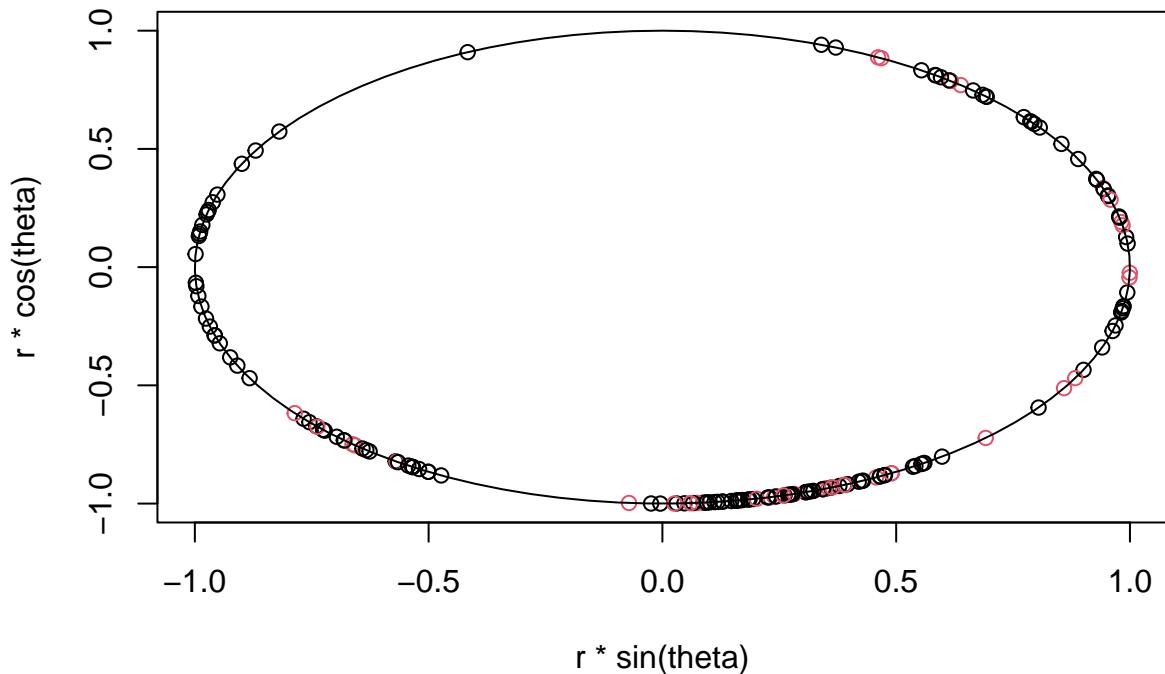


```
## [1] "Iteration 721"
```

```
## [1] "Iteration 722"  
## [1] "Iteration 723"  
## [1] "Iteration 724"  
## [1] "Iteration 725"  
## [1] "Iteration 725: objective function value is 1.500833"
```



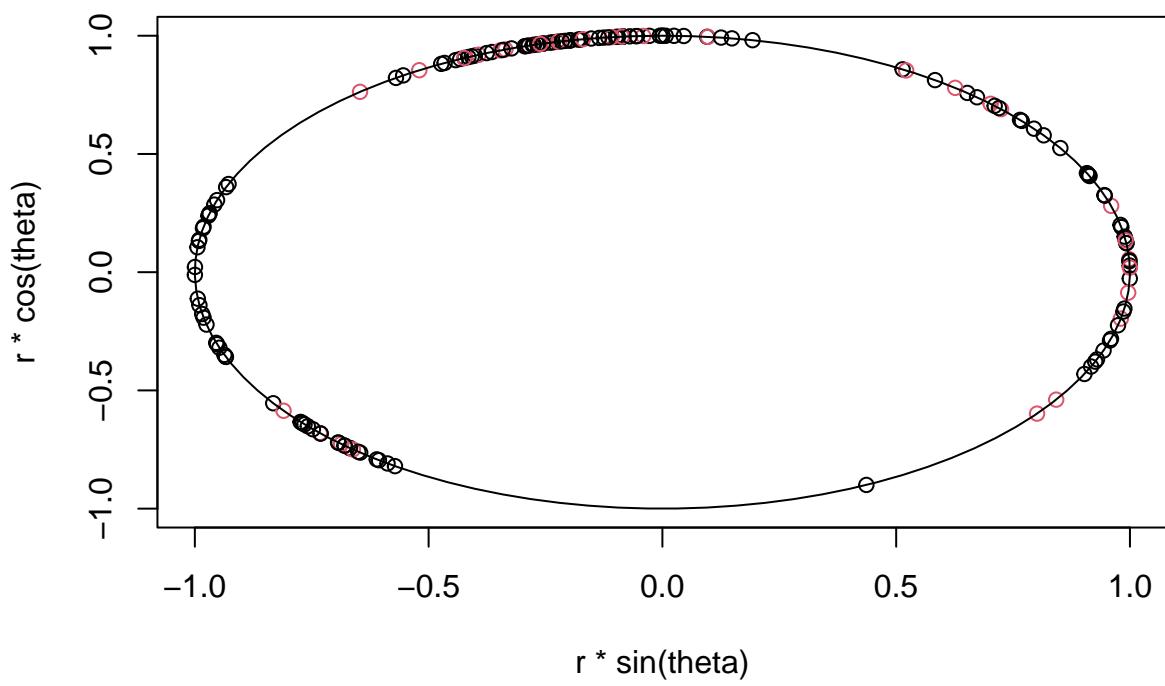
```
## [1] "Iteration 726"  
## [1] "Iteration 727"  
## [1] "Iteration 728"  
## [1] "Iteration 729"  
## [1] "Iteration 730"  
## [1] "Iteration 730: objective function value is 1.500737"
```



```

## [1] "Iteration 731"
## [1] "Iteration 732"
## [1] "Iteration 733"
## [1] "Iteration 734"
## [1] "Iteration 735"
## [1] "Iteration 735: objective function value is 1.506991"

```

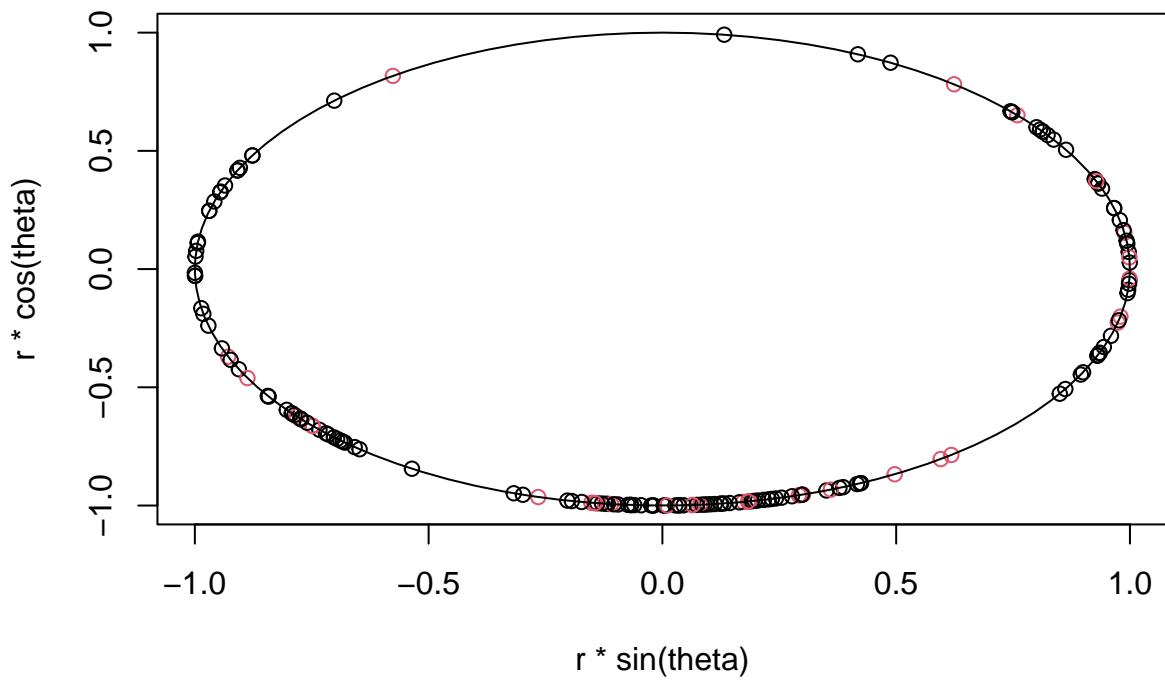


```

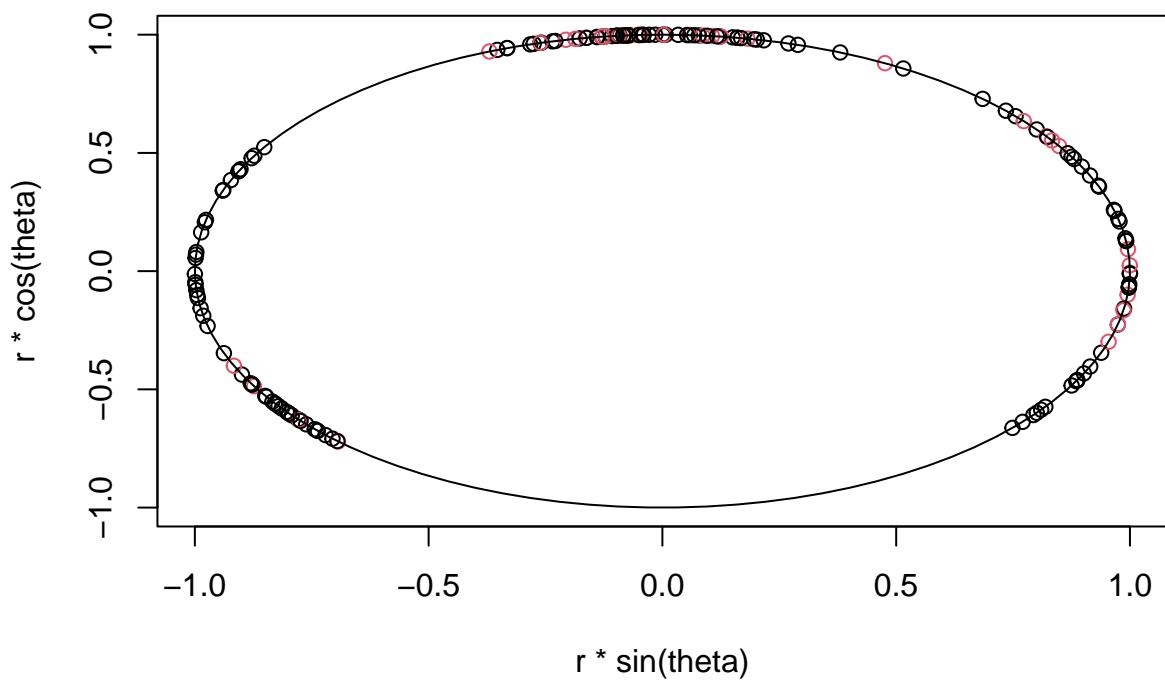
## [1] "Iteration 736"
## [1] "Iteration 737"
## [1] "Iteration 738"
## [1] "Iteration 739"

```

```
## [1] "Iteration 740"  
## [1] "Iteration 740: objective function value is 1.493461"
```

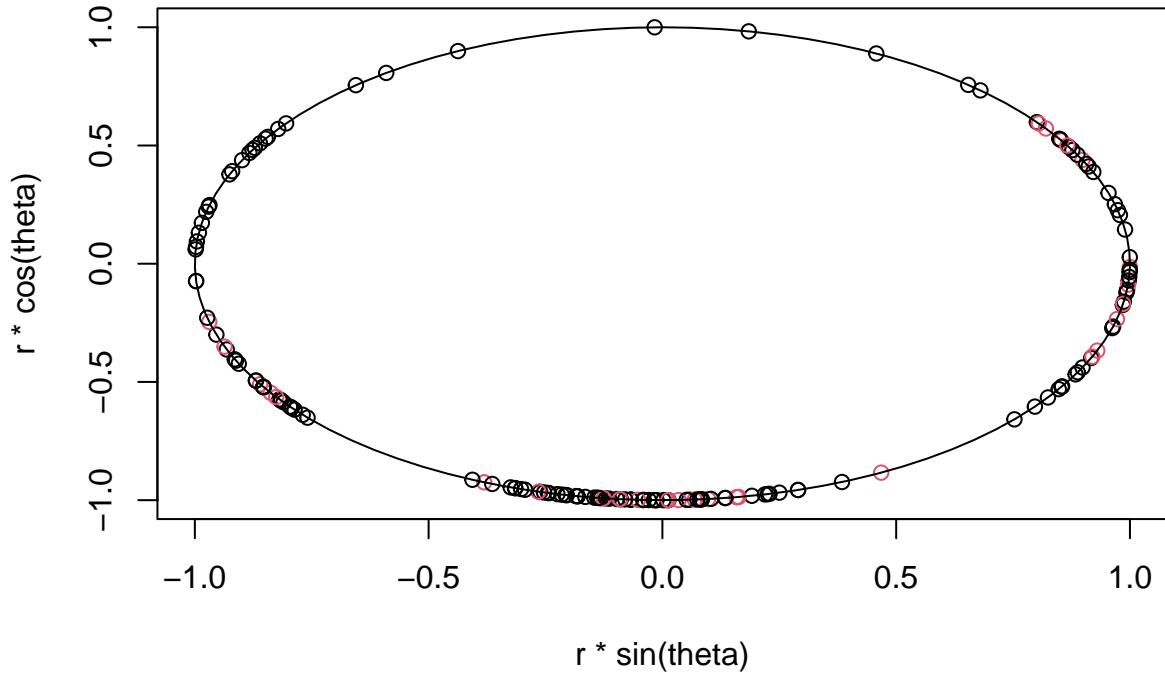


```
## [1] "Iteration 741"  
## [1] "Iteration 742"  
## [1] "Iteration 743"  
## [1] "Iteration 744"  
## [1] "Iteration 745"  
## [1] "Iteration 745: objective function value is 1.512385"
```

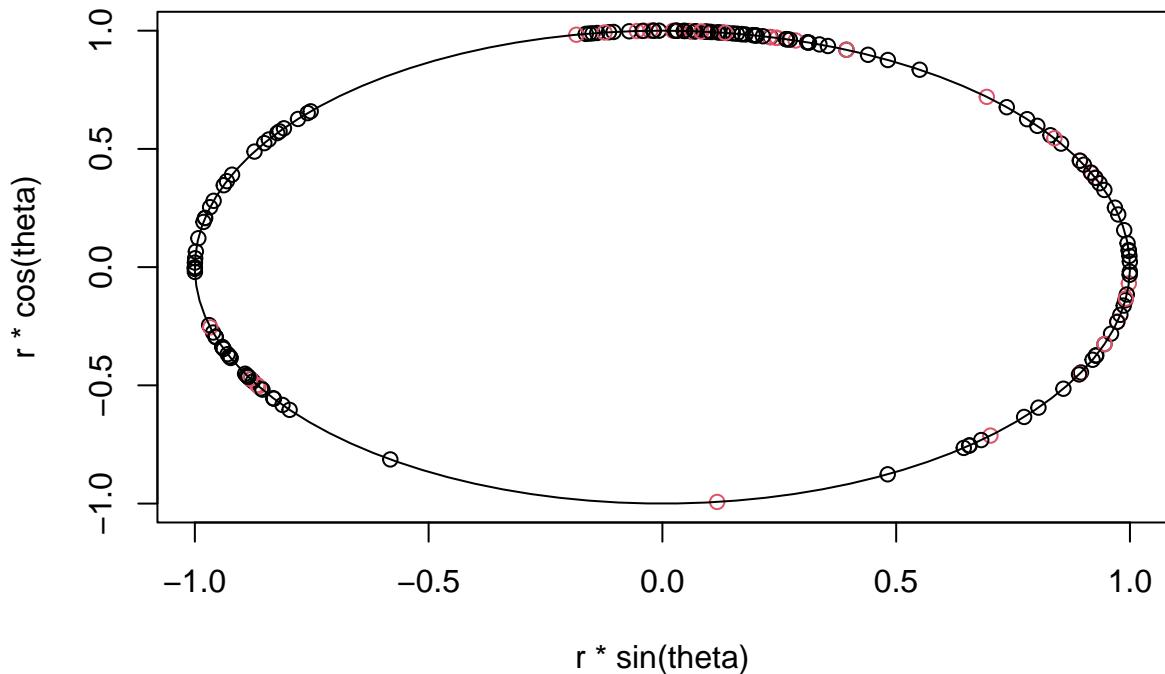


```
## [1] "Iteration 746"
```

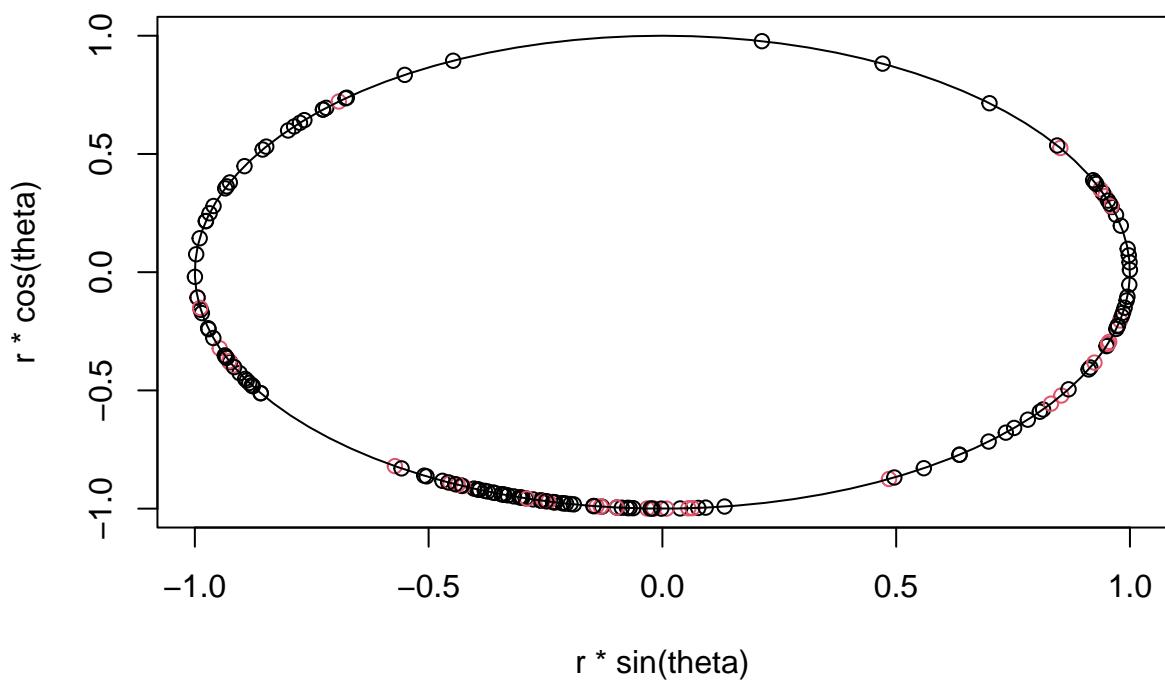
```
## [1] "Iteration 747"  
## [1] "Iteration 748"  
## [1] "Iteration 749"  
## [1] "Iteration 750"  
## [1] "Iteration 750: objective function value is 1.526573"
```



```
## [1] "Iteration 751"  
## [1] "Iteration 752"  
## [1] "Iteration 753"  
## [1] "Iteration 754"  
## [1] "Iteration 755"  
## [1] "Iteration 755: objective function value is 1.501666"
```

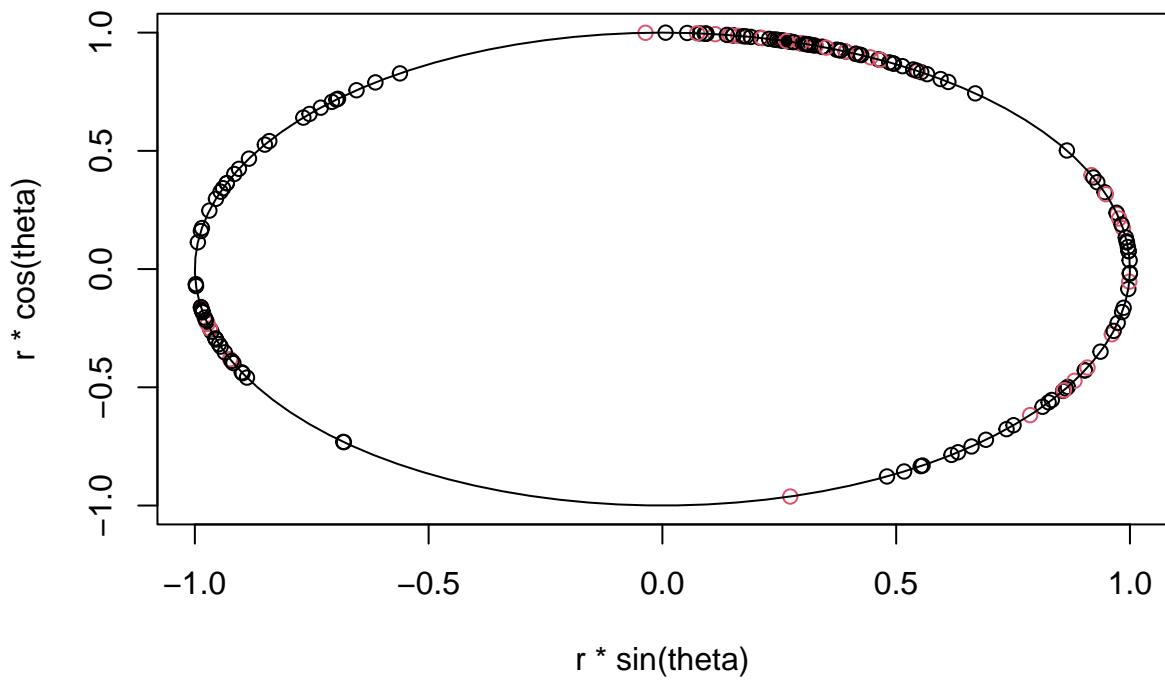


```
## [1] "Iteration 756"
## [1] "Iteration 757"
## [1] "Iteration 758"
## [1] "Iteration 759"
## [1] "Iteration 760"
## [1] "Iteration 760: objective function value is 1.509727"
```

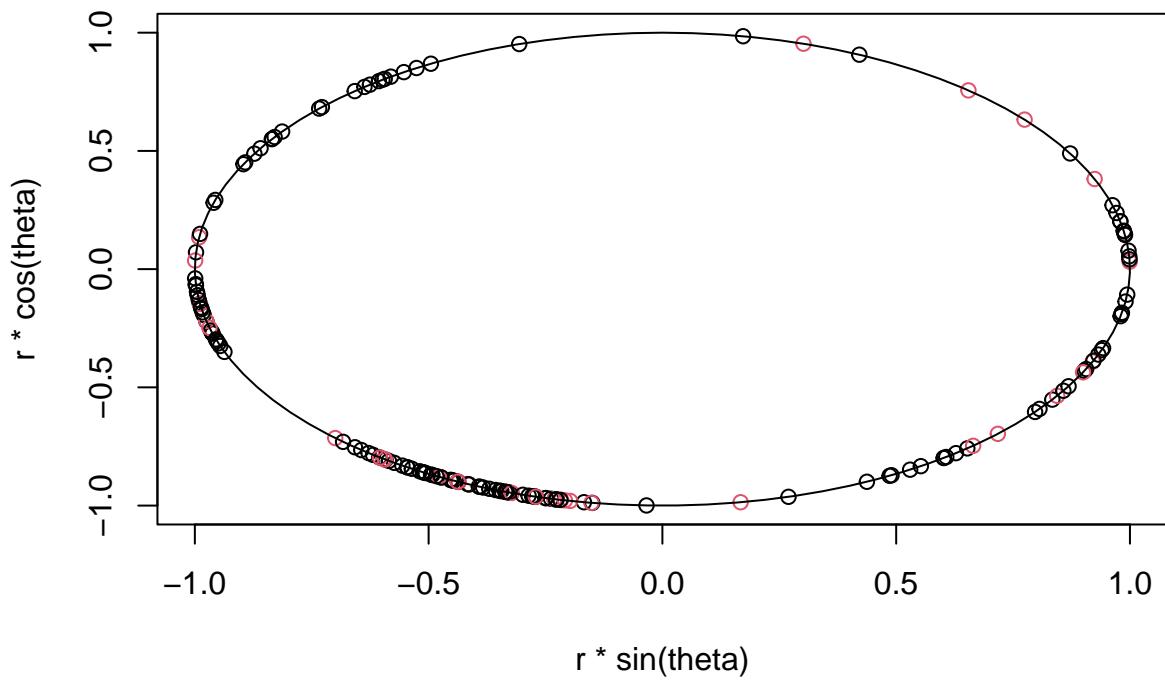


```
## [1] "Iteration 761"
## [1] "Iteration 762"
## [1] "Iteration 763"
## [1] "Iteration 764"
```

```
## [1] "Iteration 765"  
## [1] "Iteration 765: objective function value is 1.515285"
```



```
## [1] "Iteration 766"  
## [1] "Iteration 767"  
## [1] "Iteration 768"  
## [1] "Iteration 769"  
## [1] "Iteration 770"  
## [1] "Iteration 770: objective function value is 1.517044"
```

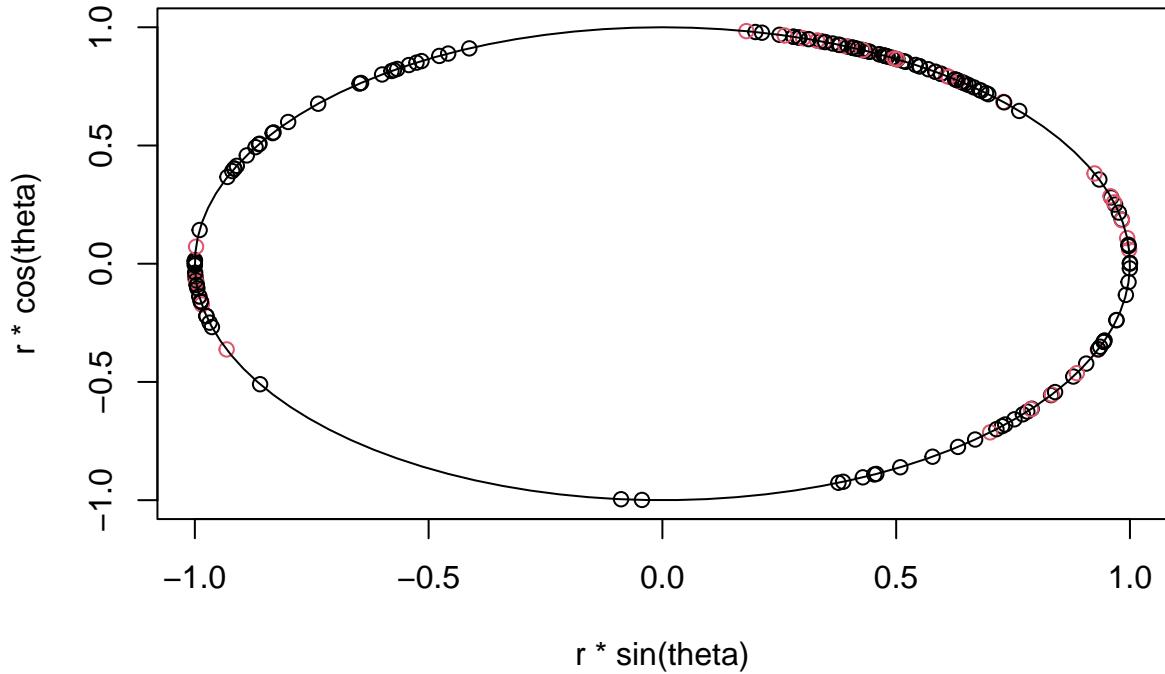


```
## [1] "Iteration 771"
```

```

## [1] "Iteration 772"
## [1] "Iteration 773"
## [1] "Iteration 774"
## [1] "Iteration 775"
## [1] "Iteration 775: objective function value is 1.501583"

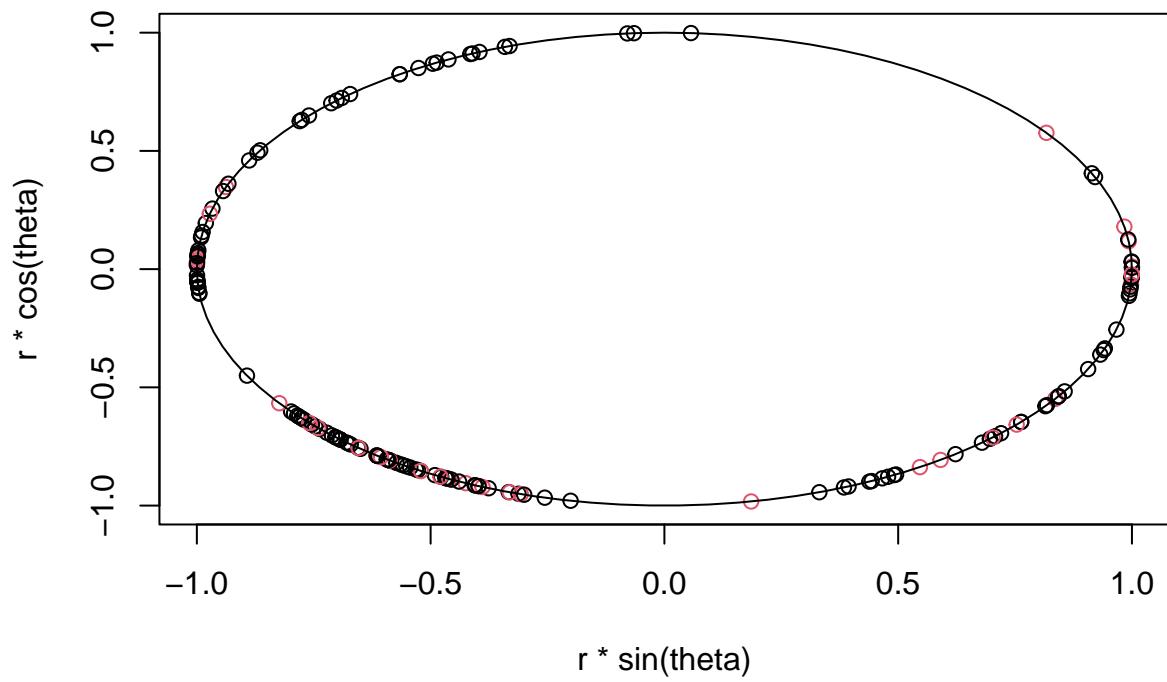
```



```

## [1] "Iteration 776"
## [1] "Iteration 777"
## [1] "Iteration 778"
## [1] "Iteration 779"
## [1] "Iteration 780"
## [1] "Iteration 780: objective function value is 1.508312"

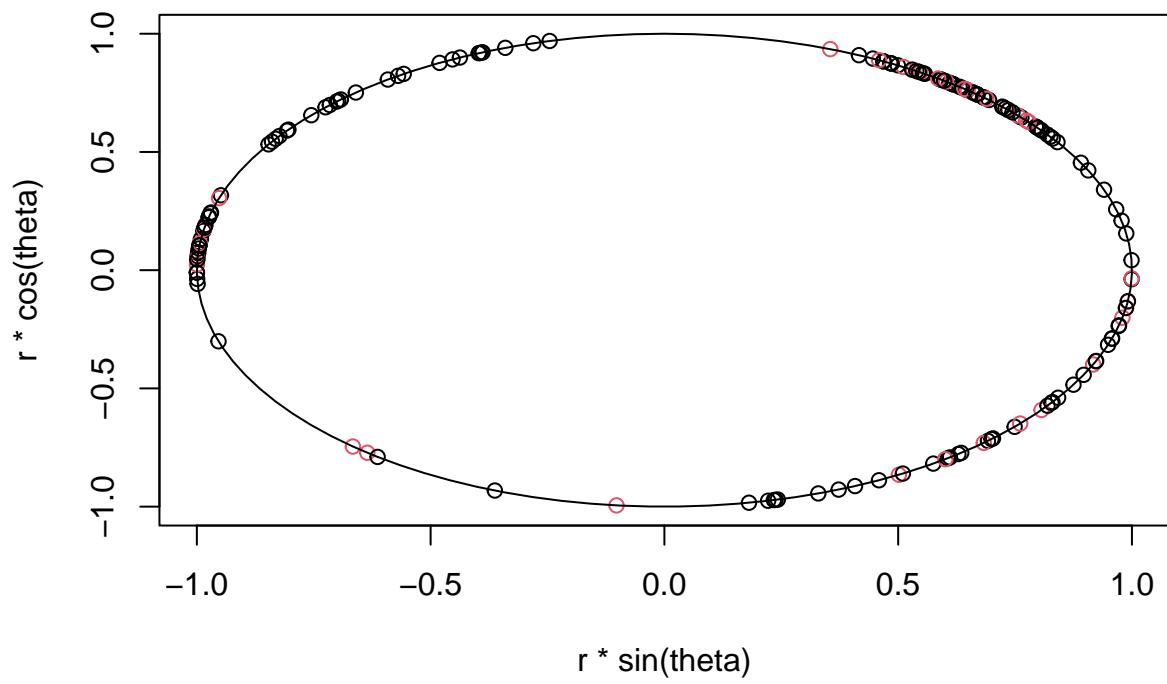
```



```

## [1] "Iteration 781"
## [1] "Iteration 782"
## [1] "Iteration 783"
## [1] "Iteration 784"
## [1] "Iteration 785"
## [1] "Iteration 785: objective function value is 1.509479"

```

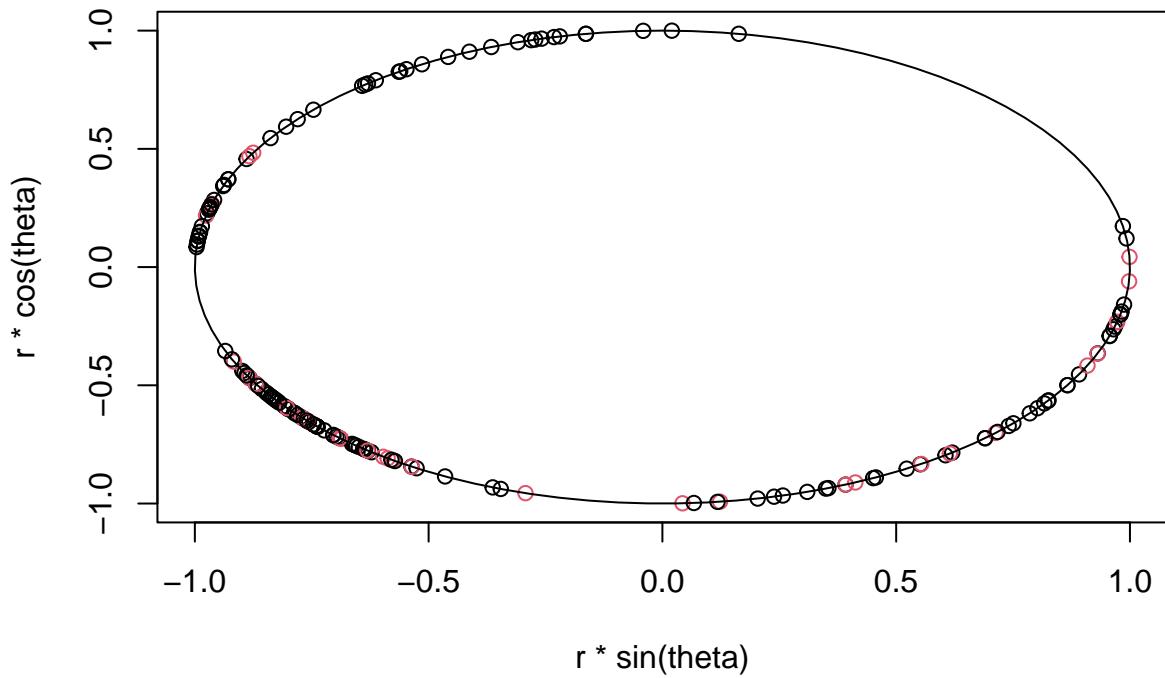


```

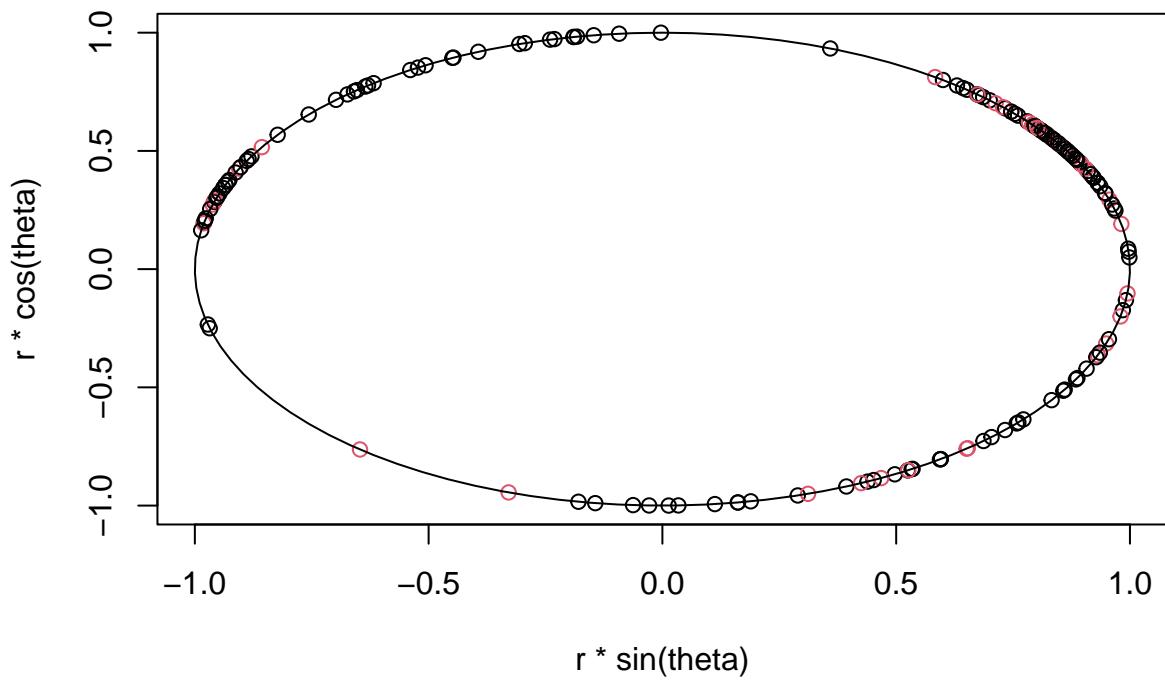
## [1] "Iteration 786"
## [1] "Iteration 787"
## [1] "Iteration 788"
## [1] "Iteration 789"

```

```
## [1] "Iteration 790"  
## [1] "Iteration 790: objective function value is 1.503009"
```

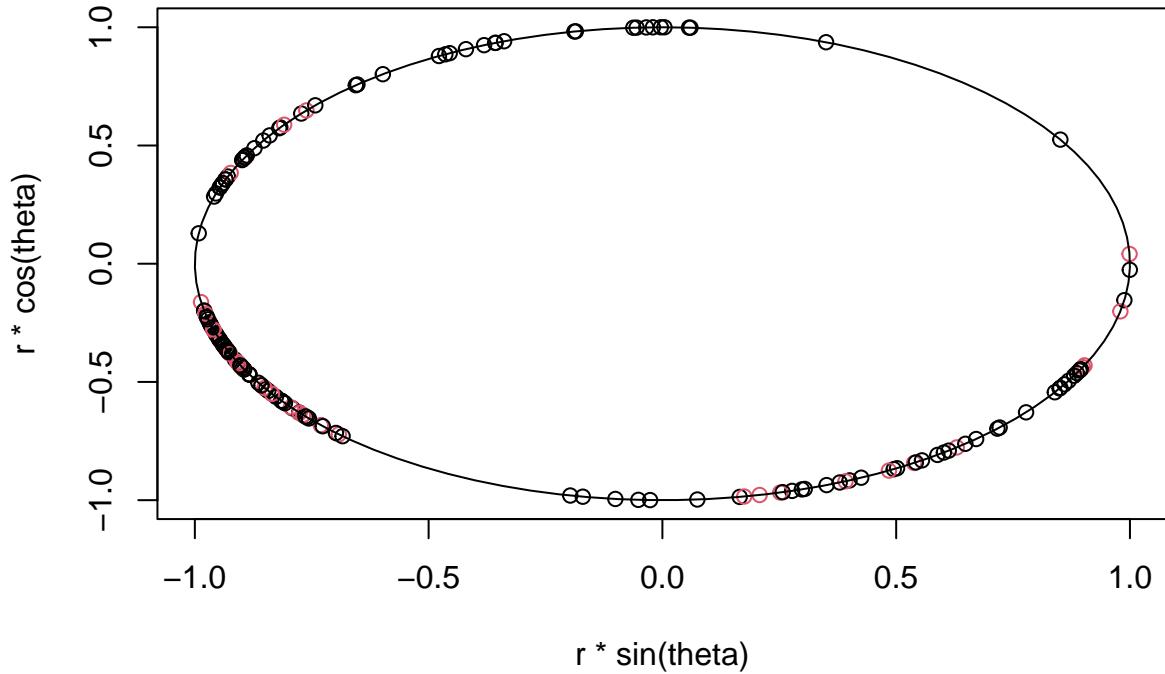


```
## [1] "Iteration 791"  
## [1] "Iteration 792"  
## [1] "Iteration 793"  
## [1] "Iteration 794"  
## [1] "Iteration 795"  
## [1] "Iteration 795: objective function value is 1.510107"
```

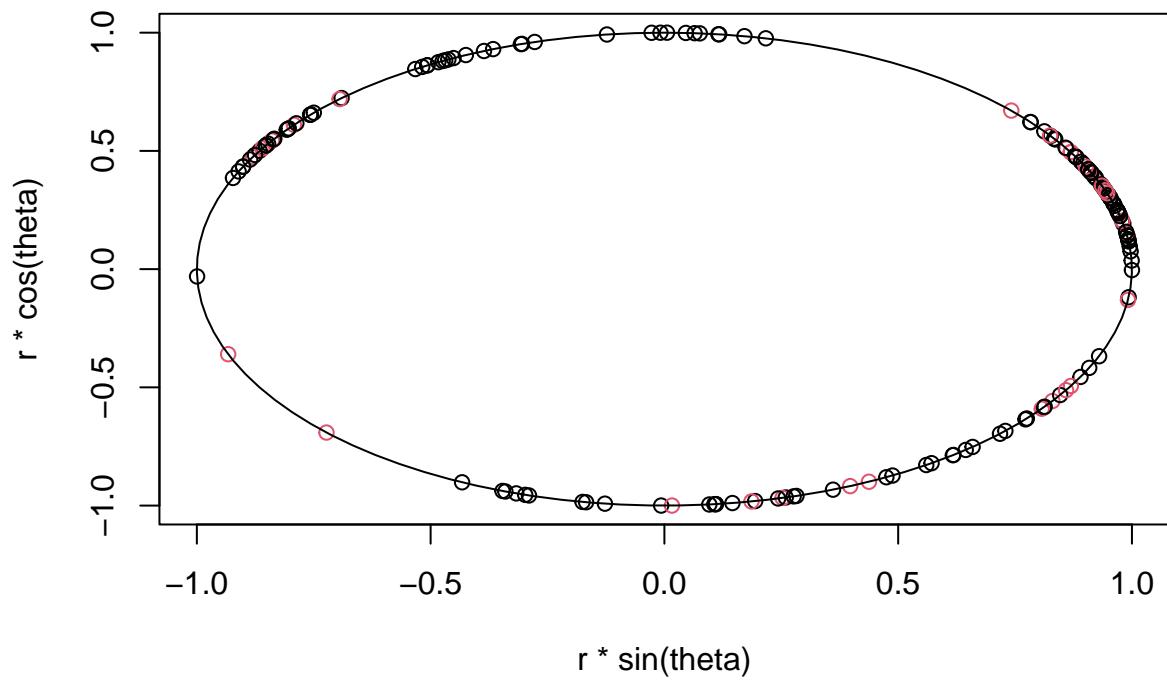


```
## [1] "Iteration 796"
```

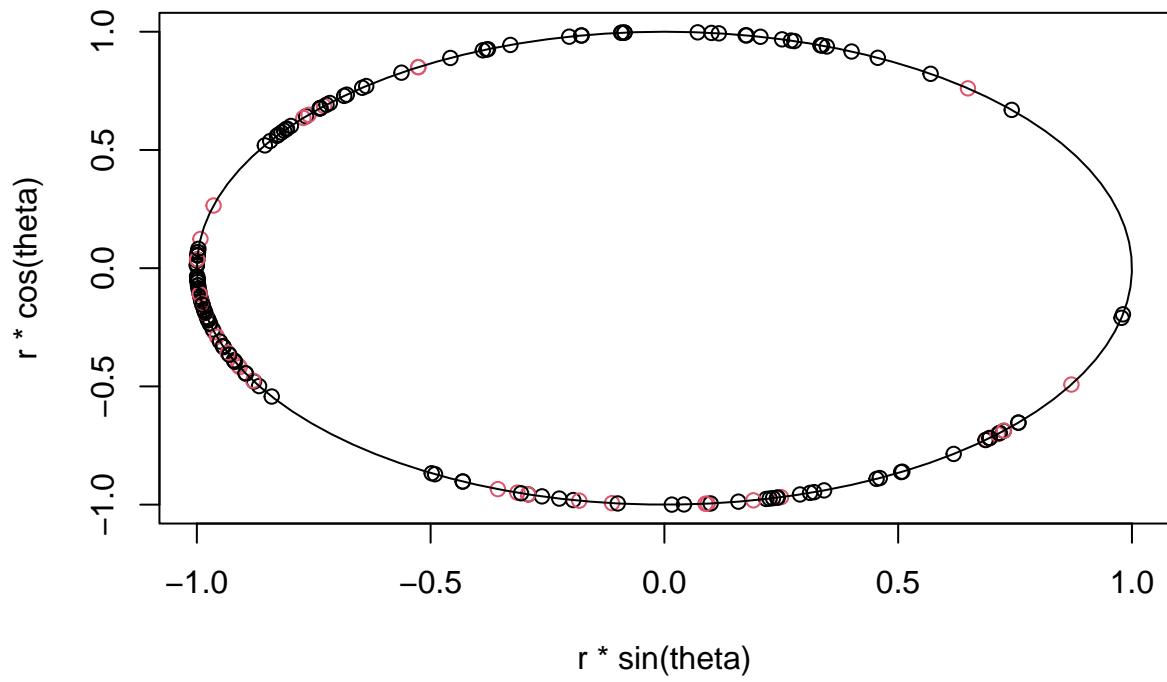
```
## [1] "Iteration 797"  
## [1] "Iteration 798"  
## [1] "Iteration 799"  
## [1] "Iteration 800"  
## [1] "Iteration 800: objective function value is 1.525737"
```



```
## [1] "Iteration 801"  
## [1] "Iteration 802"  
## [1] "Iteration 803"  
## [1] "Iteration 804"  
## [1] "Iteration 805"  
## [1] "Iteration 805: objective function value is 1.524708"
```

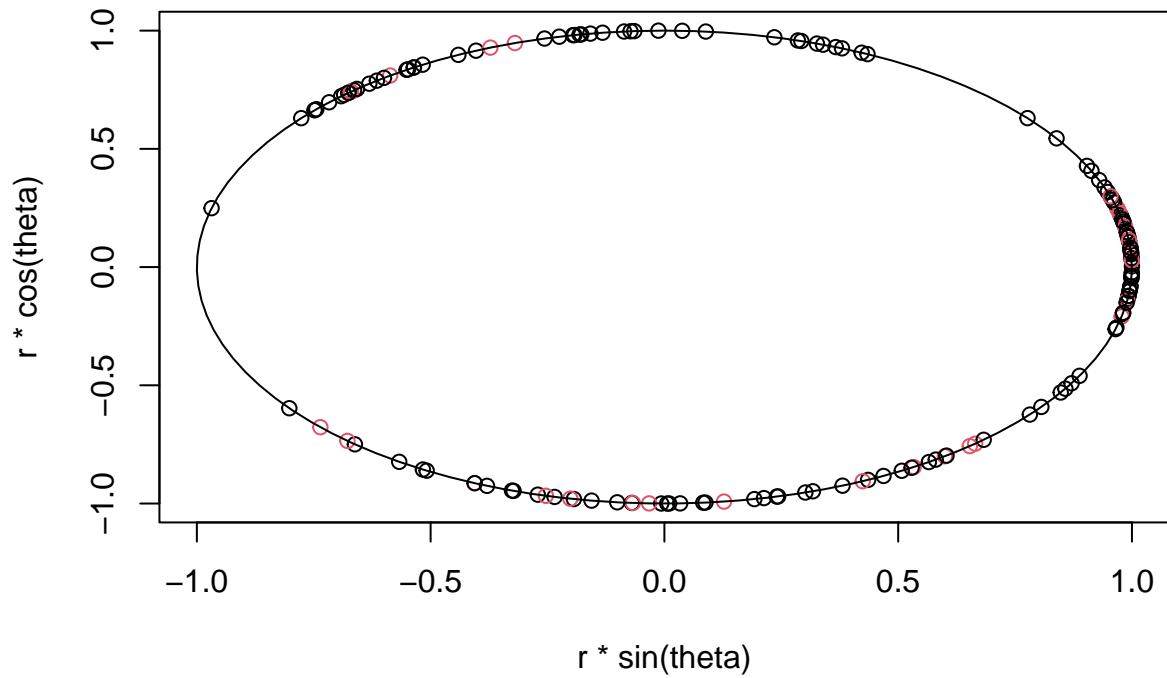


```
## [1] "Iteration 806"
## [1] "Iteration 807"
## [1] "Iteration 808"
## [1] "Iteration 809"
## [1] "Iteration 810"
## [1] "Iteration 810: objective function value is 1.509755"
```

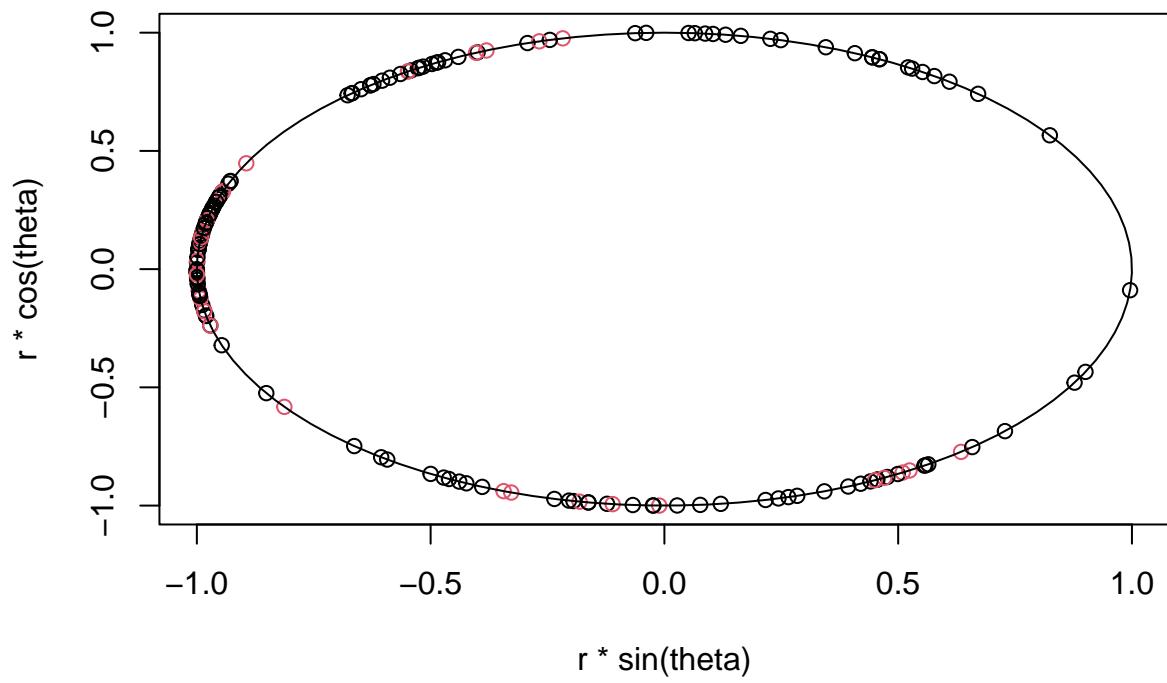


```
## [1] "Iteration 811"
## [1] "Iteration 812"
## [1] "Iteration 813"
## [1] "Iteration 814"
```

```
## [1] "Iteration 815"  
## [1] "Iteration 815: objective function value is 1.505551"
```

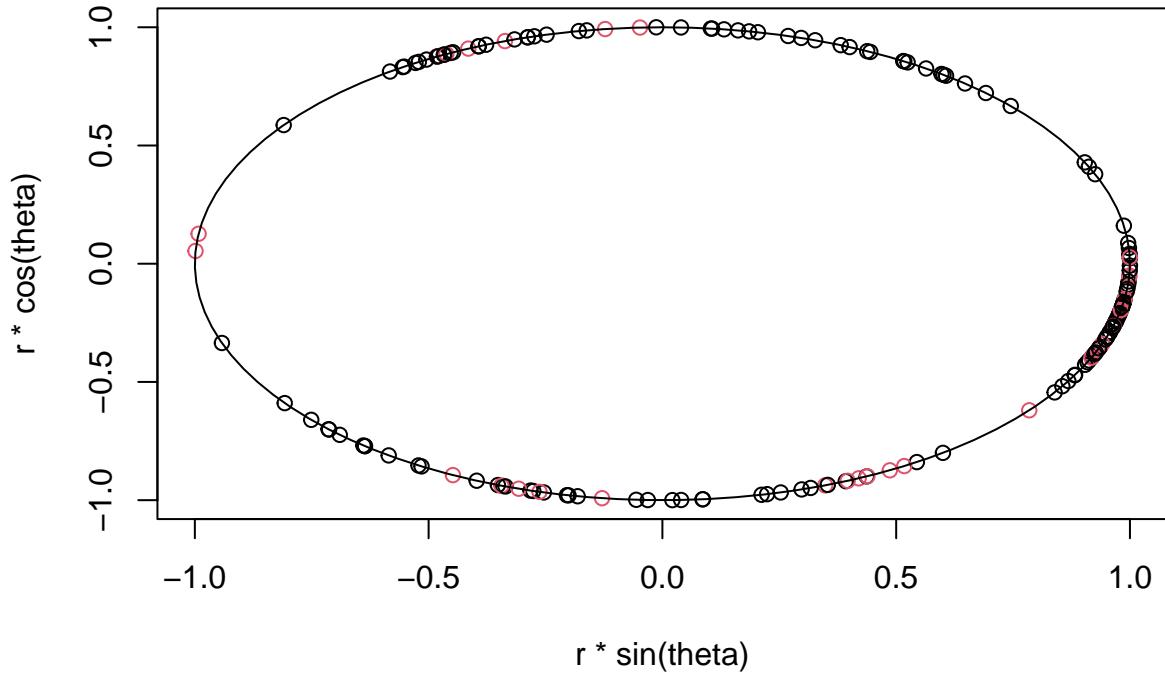


```
## [1] "Iteration 816"  
## [1] "Iteration 817"  
## [1] "Iteration 818"  
## [1] "Iteration 819"  
## [1] "Iteration 820"  
## [1] "Iteration 820: objective function value is 1.501265"
```

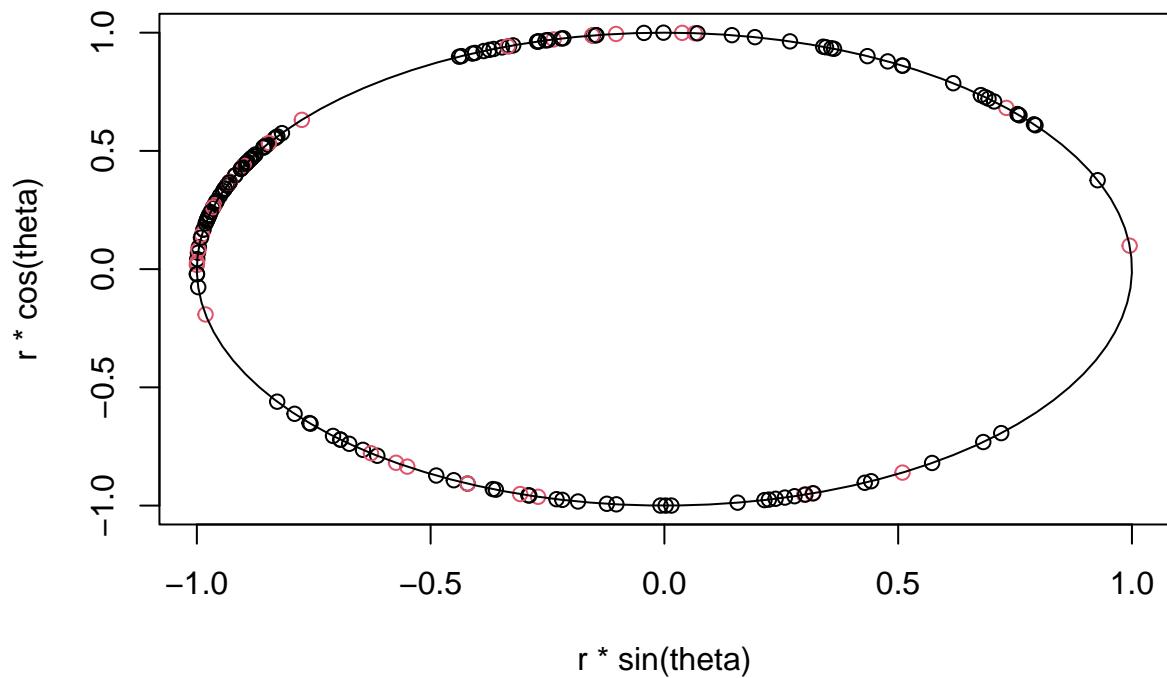


```
## [1] "Iteration 821"
```

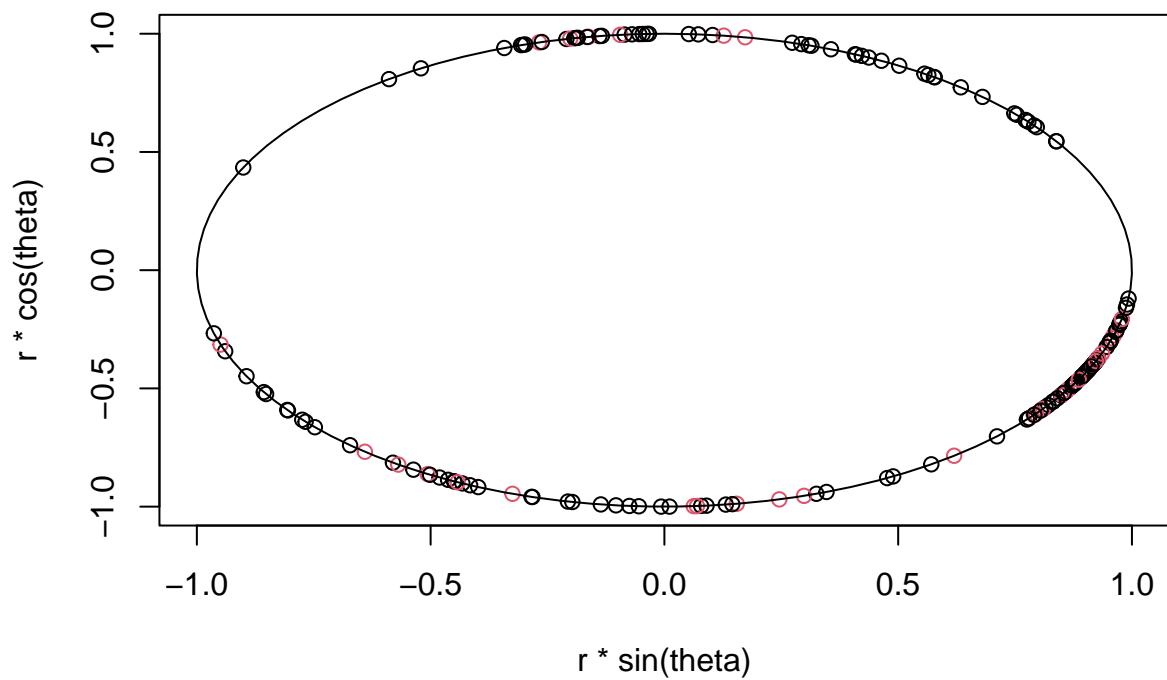
```
## [1] "Iteration 822"  
## [1] "Iteration 823"  
## [1] "Iteration 824"  
## [1] "Iteration 825"  
## [1] "Iteration 825: objective function value is 1.510537"
```



```
## [1] "Iteration 826"  
## [1] "Iteration 827"  
## [1] "Iteration 828"  
## [1] "Iteration 829"  
## [1] "Iteration 830"  
## [1] "Iteration 830: objective function value is 1.541241"
```

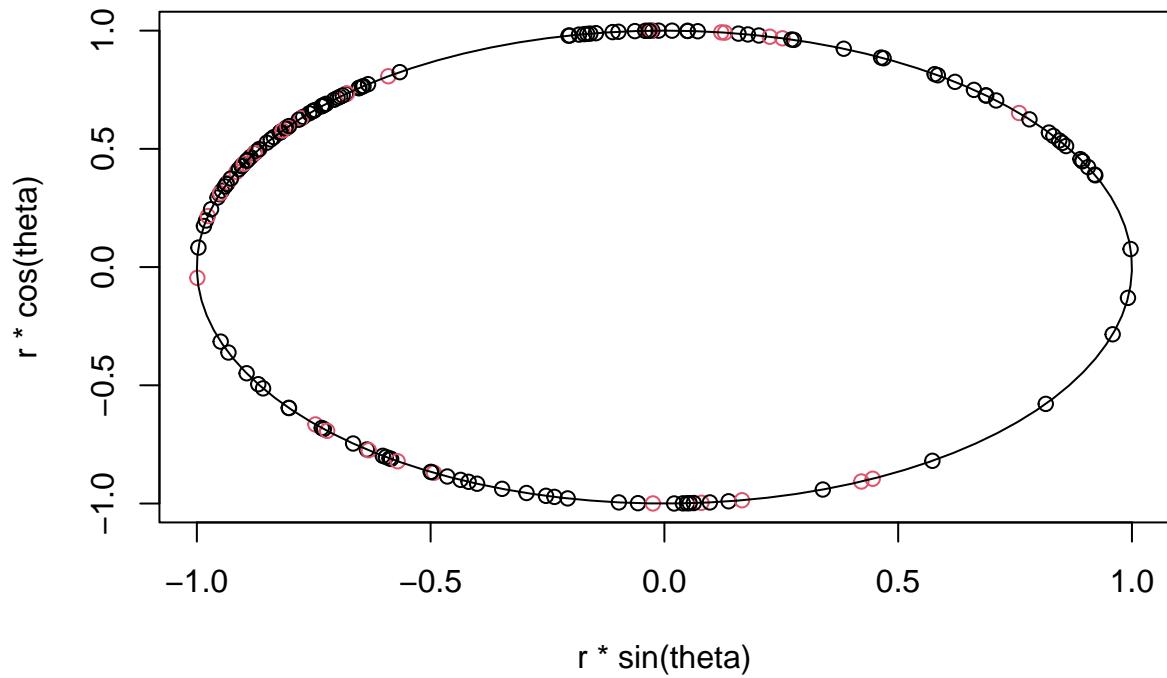


```
## [1] "Iteration 831"
## [1] "Iteration 832"
## [1] "Iteration 833"
## [1] "Iteration 834"
## [1] "Iteration 835"
## [1] "Iteration 835: objective function value is 1.508345"
```

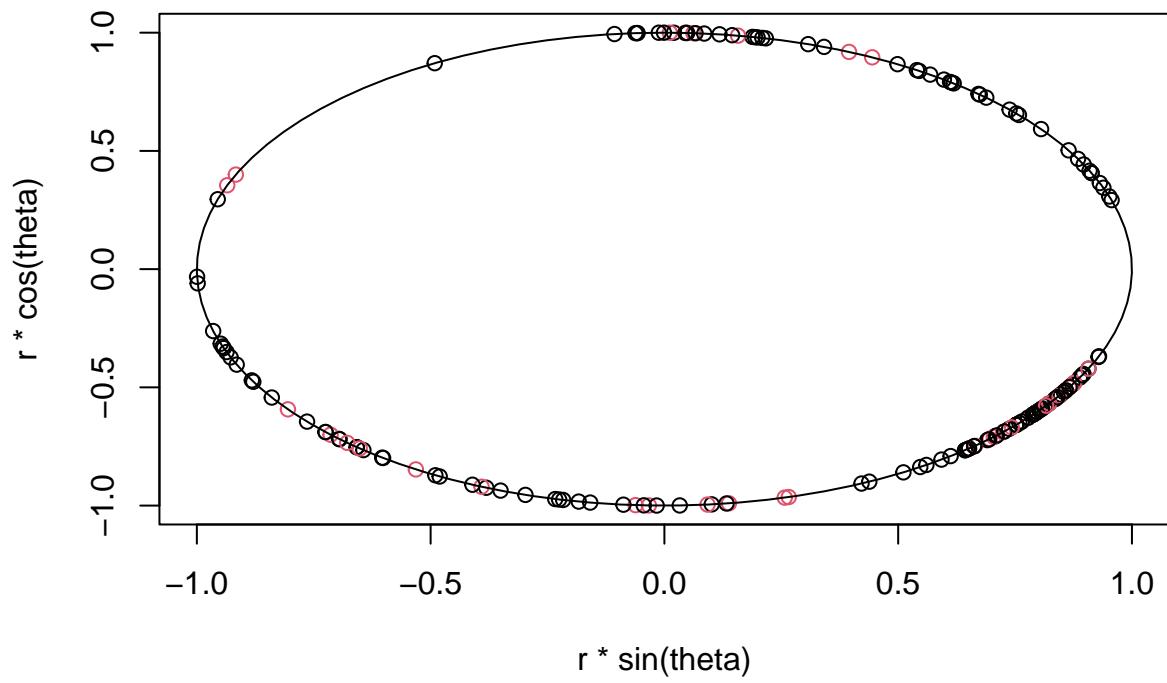


```
## [1] "Iteration 836"
## [1] "Iteration 837"
## [1] "Iteration 838"
## [1] "Iteration 839"
```

```
## [1] "Iteration 840"  
## [1] "Iteration 840: objective function value is 1.522268"
```

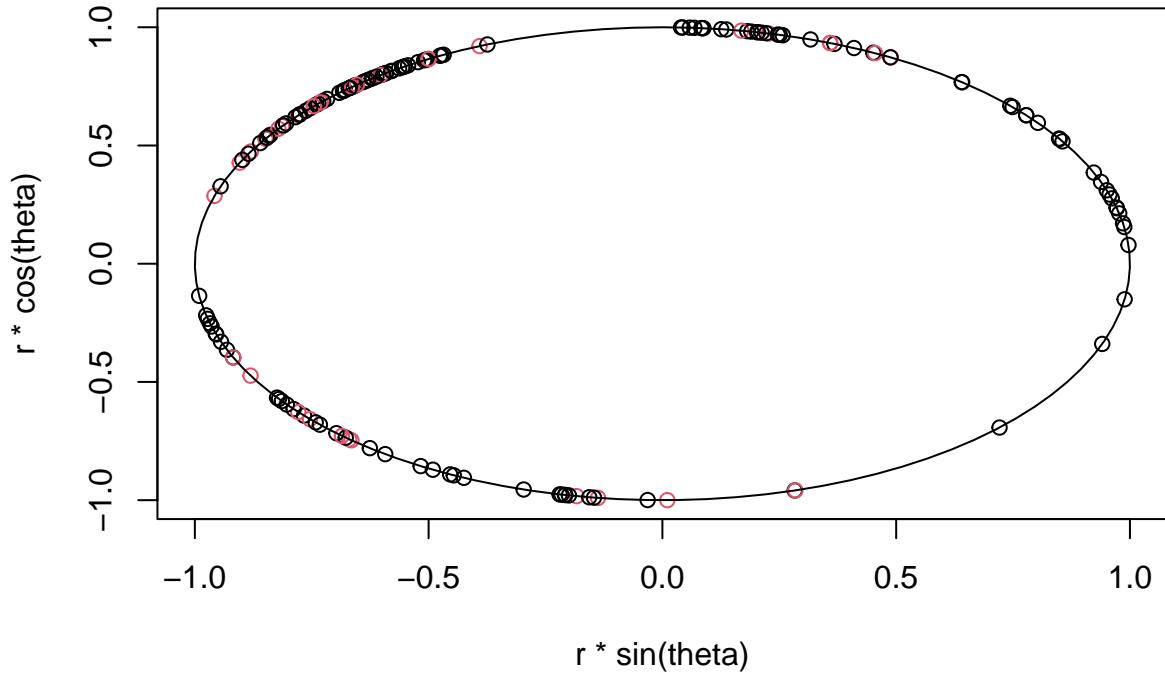


```
## [1] "Iteration 841"  
## [1] "Iteration 842"  
## [1] "Iteration 843"  
## [1] "Iteration 844"  
## [1] "Iteration 845"  
## [1] "Iteration 845: objective function value is 1.502279"
```

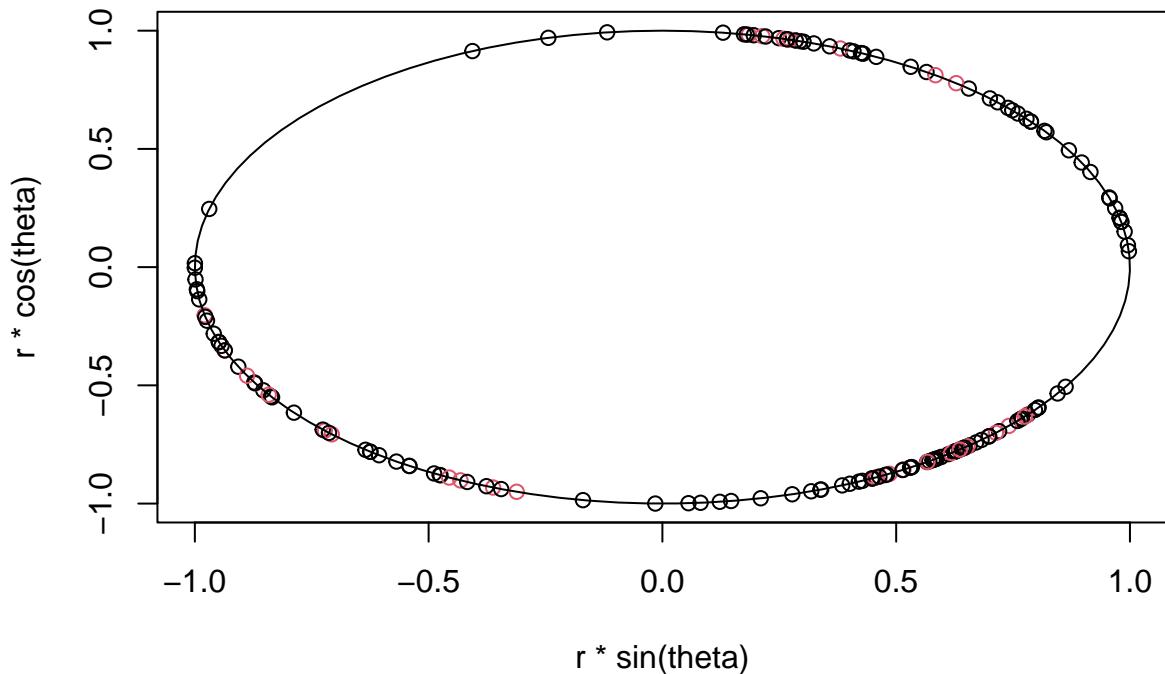


```
## [1] "Iteration 846"
```

```
## [1] "Iteration 847"  
## [1] "Iteration 848"  
## [1] "Iteration 849"  
## [1] "Iteration 850"  
## [1] "Iteration 850: objective function value is 1.523763"
```



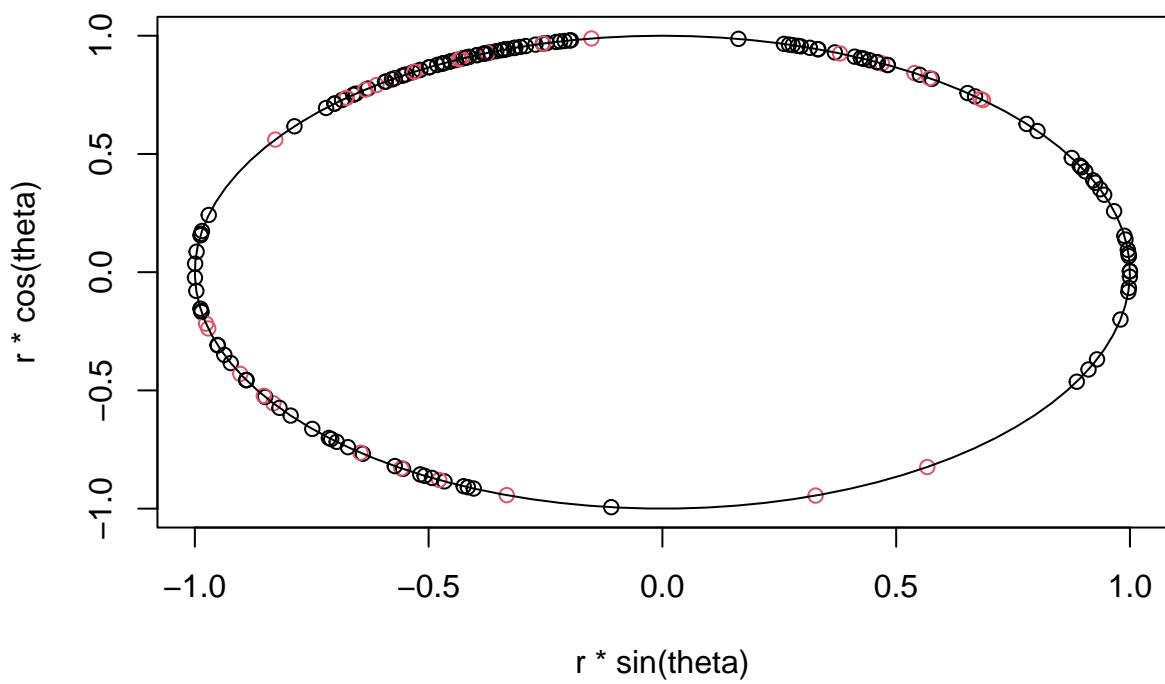
```
## [1] "Iteration 851"  
## [1] "Iteration 852"  
## [1] "Iteration 853"  
## [1] "Iteration 854"  
## [1] "Iteration 855"  
## [1] "Iteration 855: objective function value is 1.503568"
```



```

## [1] "Iteration 856"
## [1] "Iteration 857"
## [1] "Iteration 858"
## [1] "Iteration 859"
## [1] "Iteration 860"
## [1] "Iteration 860: objective function value is 1.514914"

```

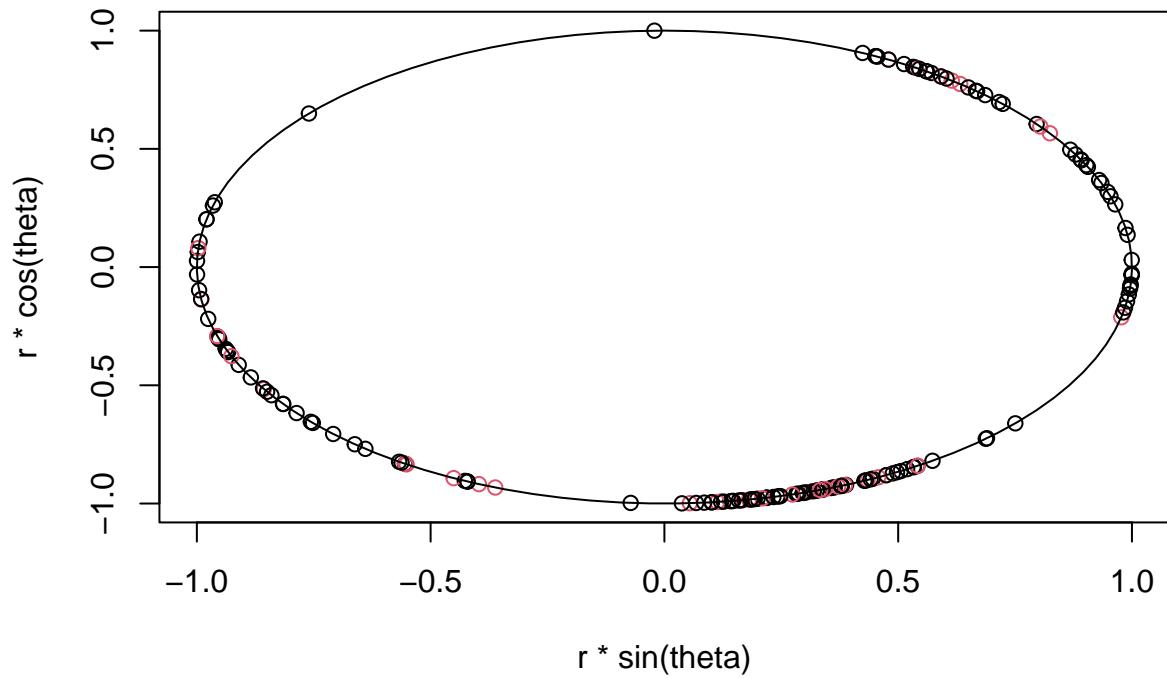


```

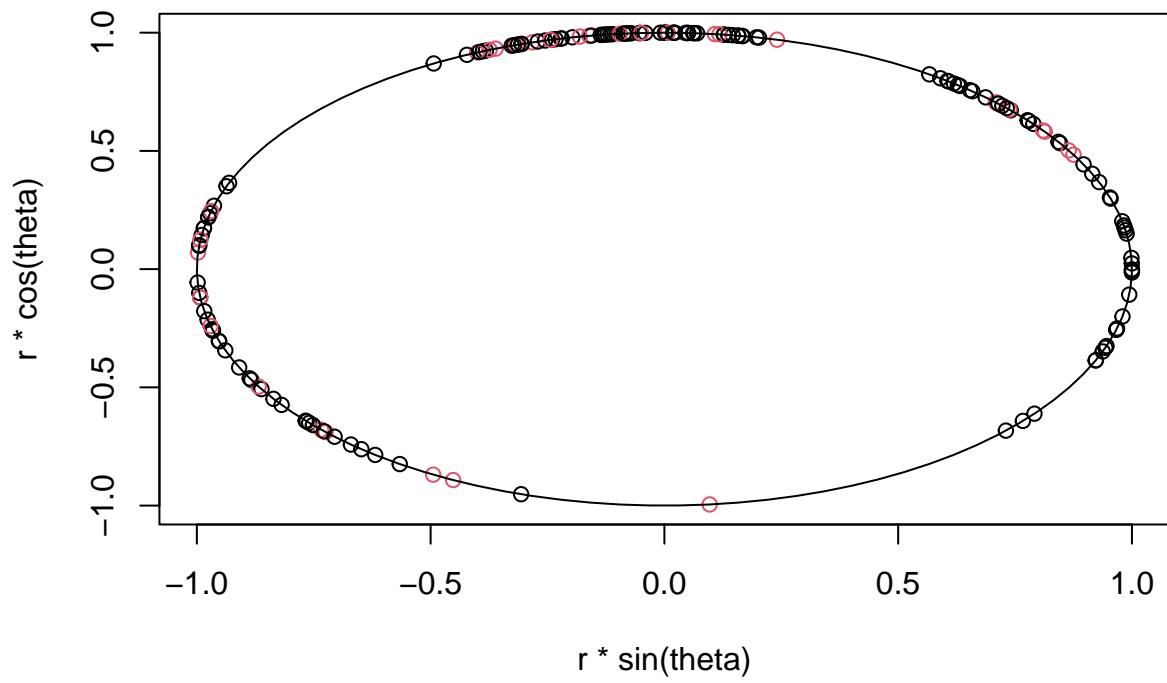
## [1] "Iteration 861"
## [1] "Iteration 862"
## [1] "Iteration 863"
## [1] "Iteration 864"

```

```
## [1] "Iteration 865"  
## [1] "Iteration 865: objective function value is 1.514668"
```



```
## [1] "Iteration 866"  
## [1] "Iteration 867"  
## [1] "Iteration 868"  
## [1] "Iteration 869"  
## [1] "Iteration 870"  
## [1] "Iteration 870: objective function value is 1.492314"
```

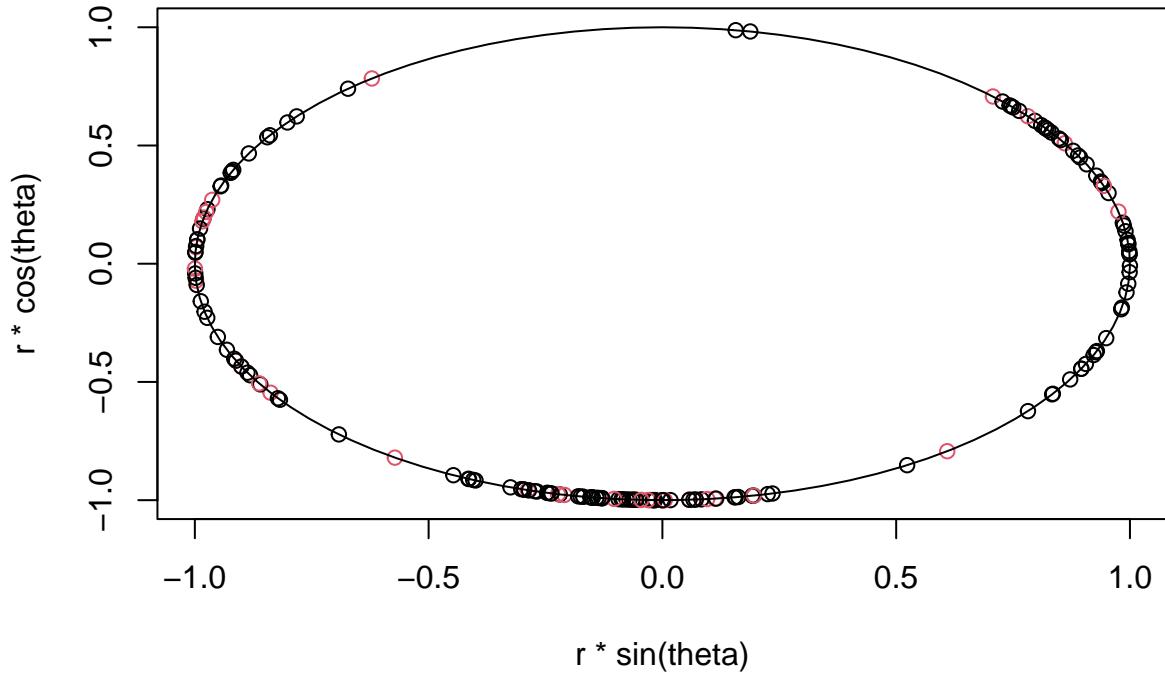


```
## [1] "Iteration 871"
```

```

## [1] "Iteration 872"
## [1] "Iteration 873"
## [1] "Iteration 874"
## [1] "Iteration 875"
## [1] "Iteration 875: objective function value is 1.518326"

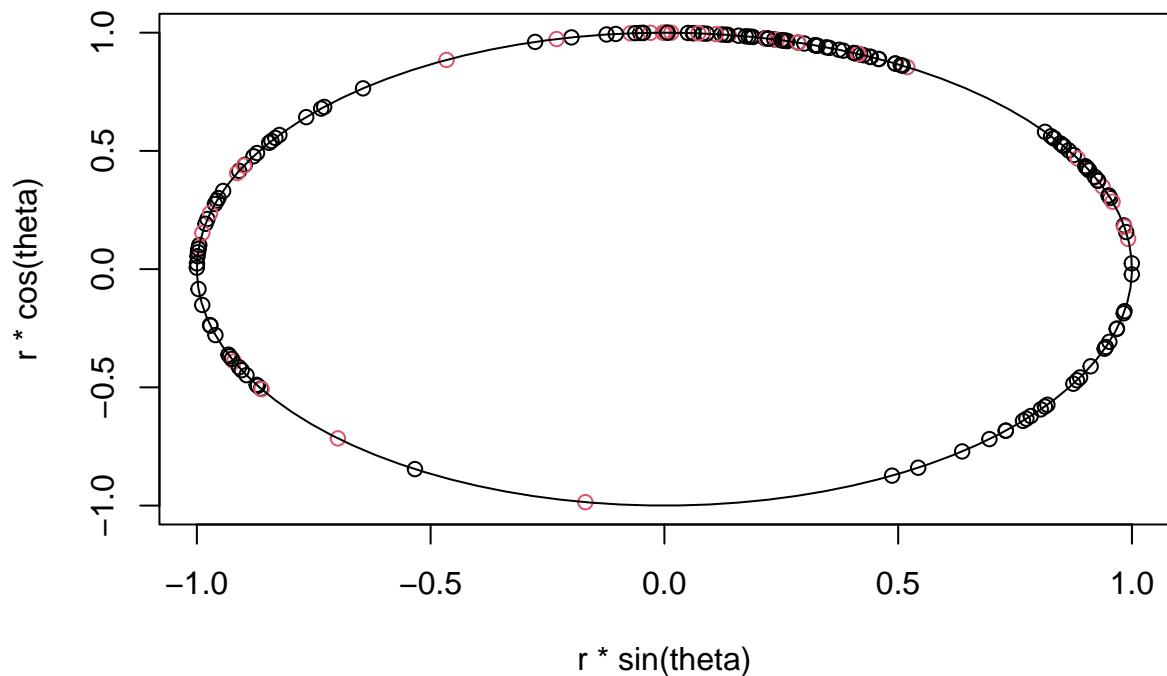
```



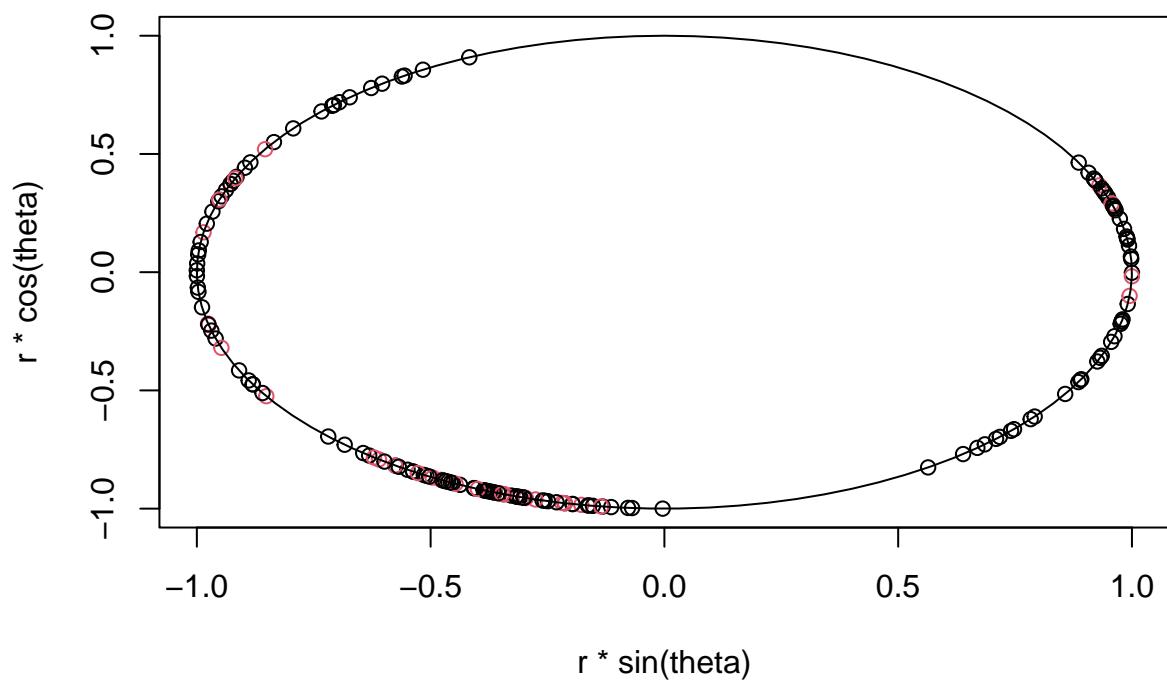
```

## [1] "Iteration 876"
## [1] "Iteration 877"
## [1] "Iteration 878"
## [1] "Iteration 879"
## [1] "Iteration 880"
## [1] "Iteration 880: objective function value is 1.503072"

```

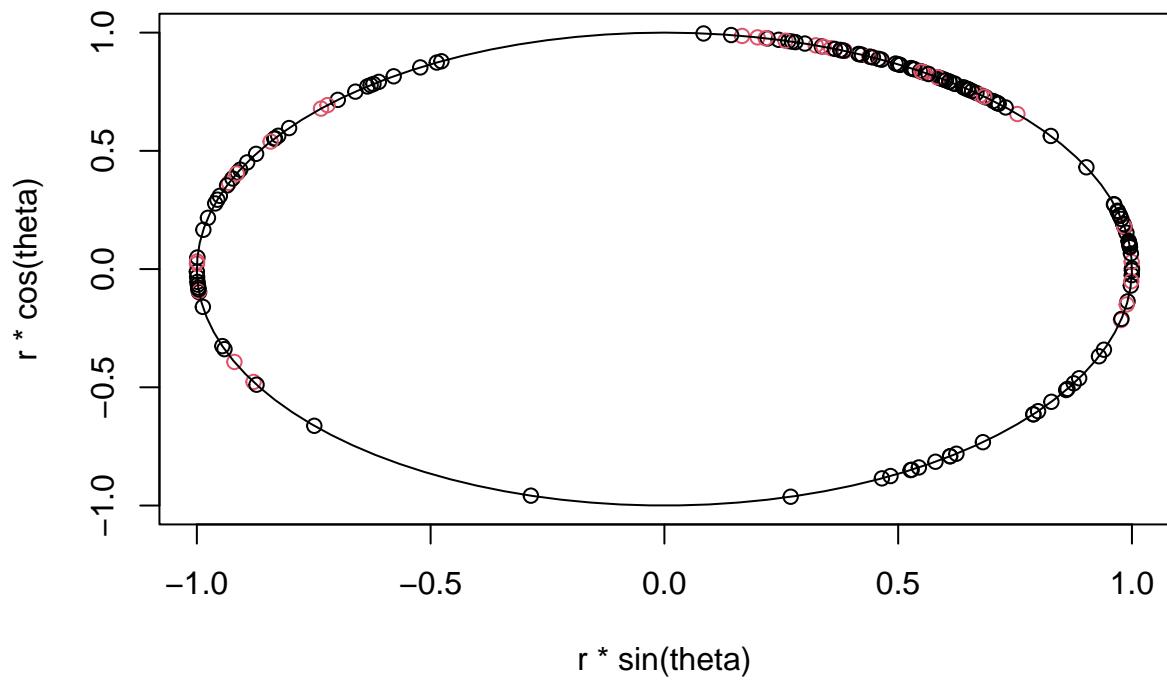


```
## [1] "Iteration 881"
## [1] "Iteration 882"
## [1] "Iteration 883"
## [1] "Iteration 884"
## [1] "Iteration 885"
## [1] "Iteration 885: objective function value is 1.515824"
```

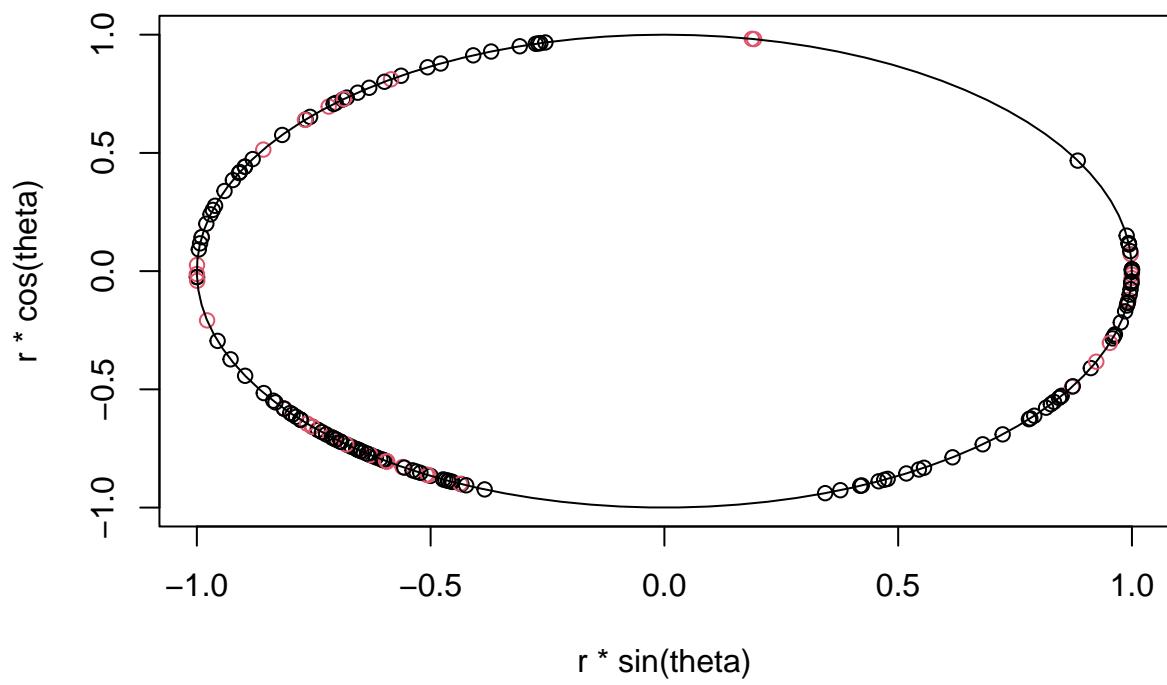


```
## [1] "Iteration 886"
## [1] "Iteration 887"
## [1] "Iteration 888"
## [1] "Iteration 889"
```

```
## [1] "Iteration 890"  
## [1] "Iteration 890: objective function value is 1.512253"
```

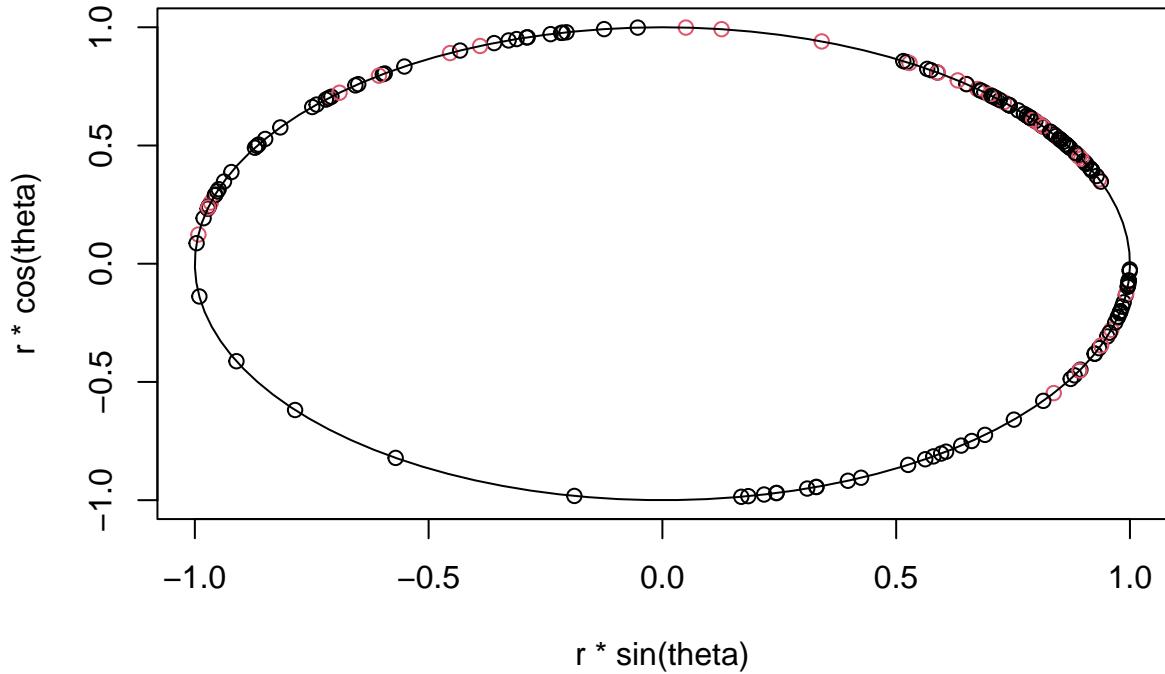


```
## [1] "Iteration 891"  
## [1] "Iteration 892"  
## [1] "Iteration 893"  
## [1] "Iteration 894"  
## [1] "Iteration 895"  
## [1] "Iteration 895: objective function value is 1.518491"
```

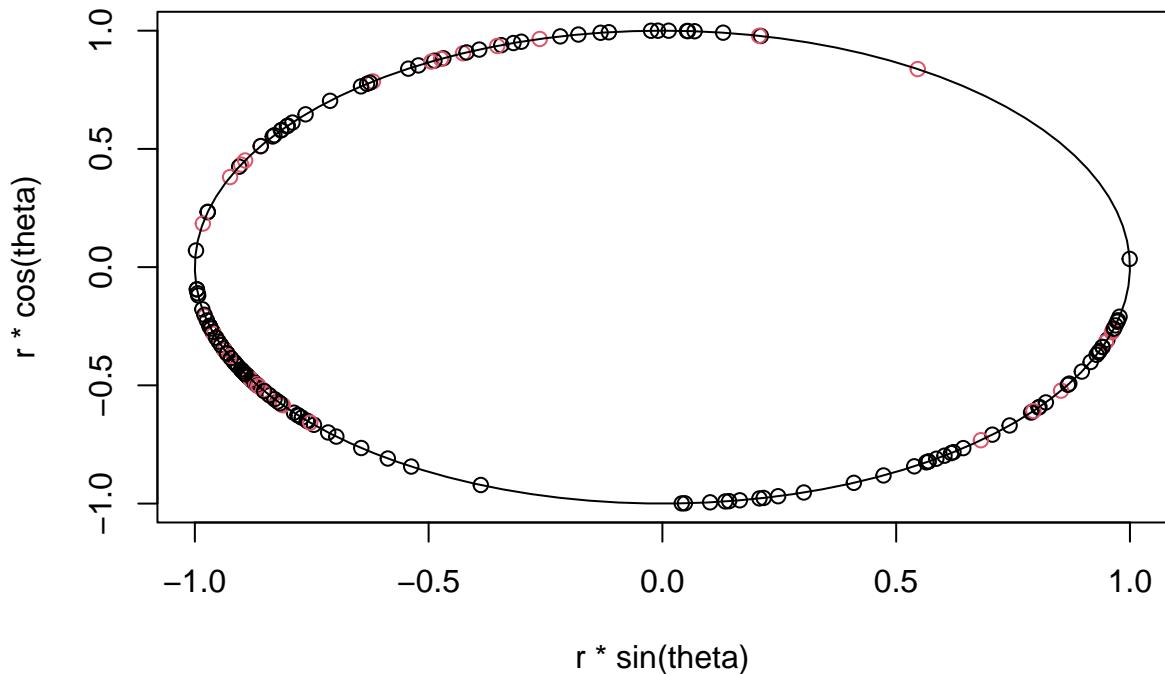


```
## [1] "Iteration 896"
```

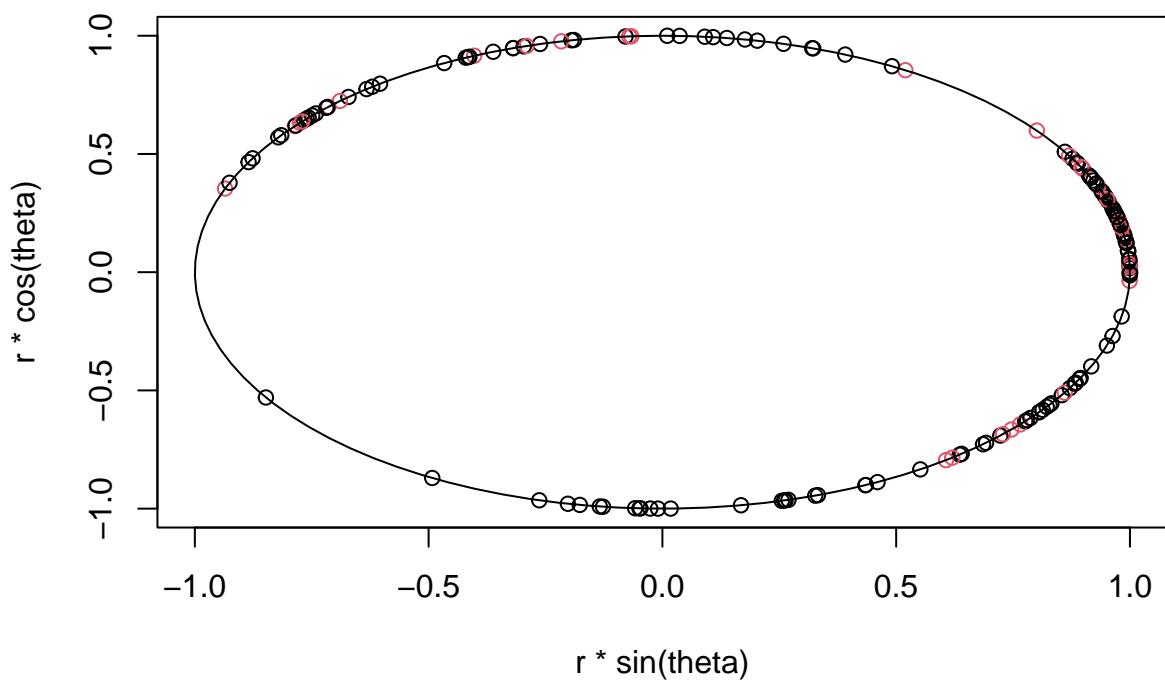
```
## [1] "Iteration 897"  
## [1] "Iteration 898"  
## [1] "Iteration 899"  
## [1] "Iteration 900"  
## [1] "Iteration 900: objective function value is 1.510227"
```



```
## [1] "Iteration 901"  
## [1] "Iteration 902"  
## [1] "Iteration 903"  
## [1] "Iteration 904"  
## [1] "Iteration 905"  
## [1] "Iteration 905: objective function value is 1.508882"
```

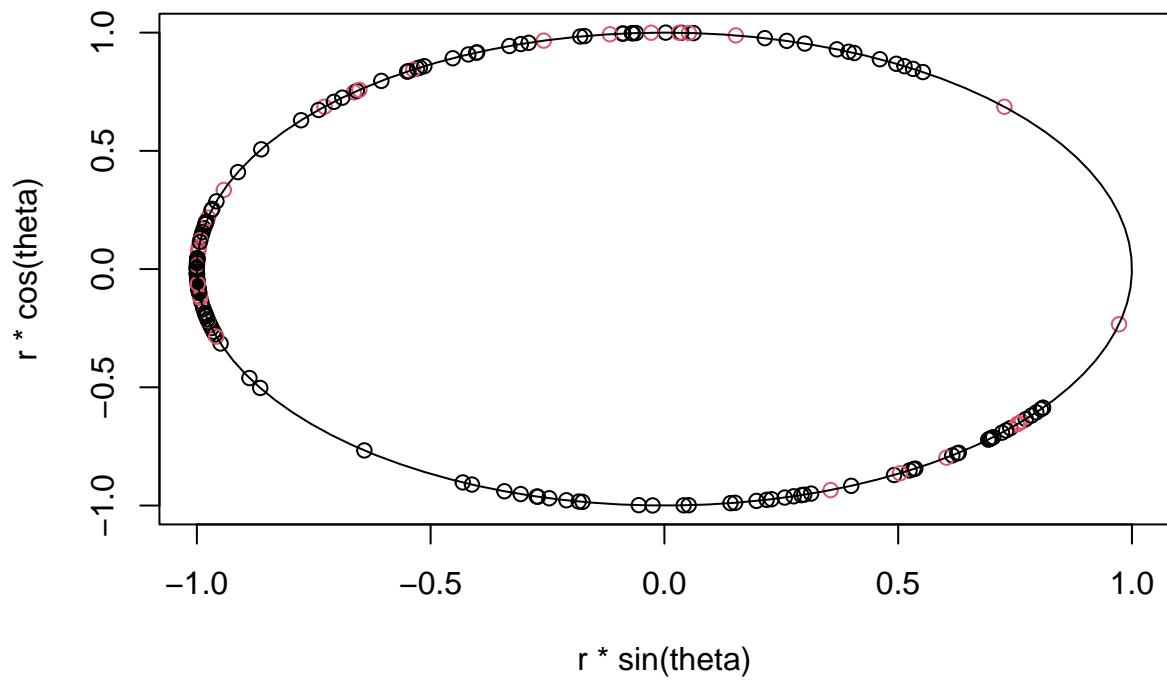


```
## [1] "Iteration 906"
## [1] "Iteration 907"
## [1] "Iteration 908"
## [1] "Iteration 909"
## [1] "Iteration 910"
## [1] "Iteration 910: objective function value is 1.502132"
```

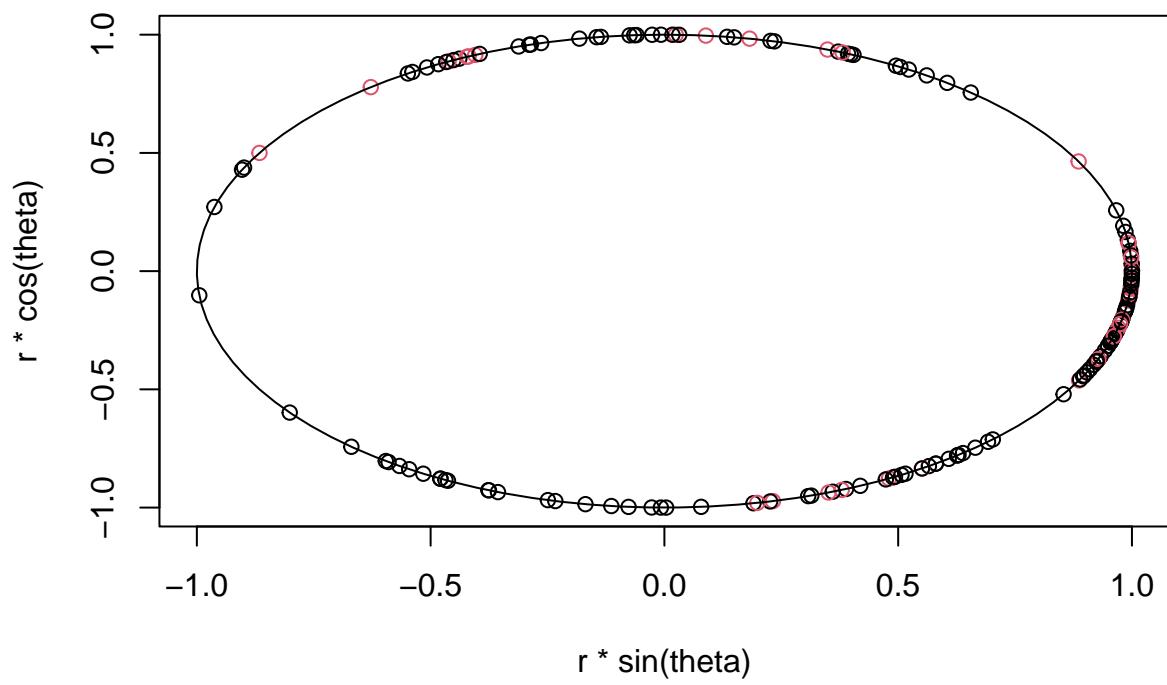


```
## [1] "Iteration 911"
## [1] "Iteration 912"
## [1] "Iteration 913"
## [1] "Iteration 914"
```

```
## [1] "Iteration 915"  
## [1] "Iteration 915: objective function value is 1.522782"
```

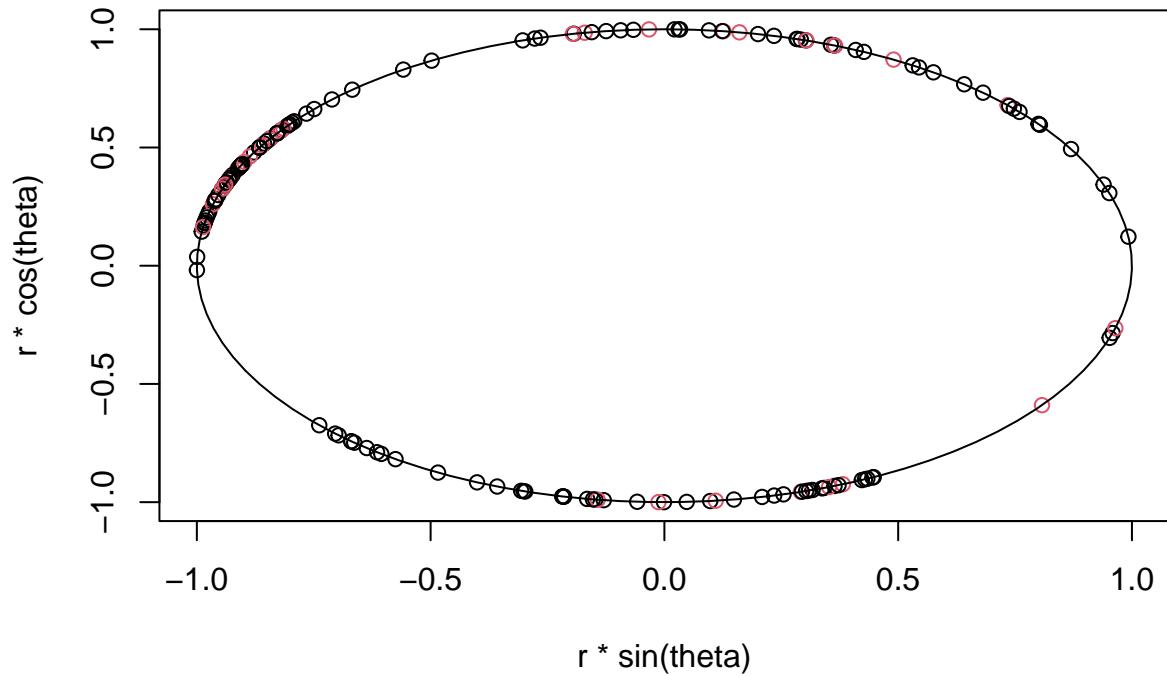


```
## [1] "Iteration 916"  
## [1] "Iteration 917"  
## [1] "Iteration 918"  
## [1] "Iteration 919"  
## [1] "Iteration 920"  
## [1] "Iteration 920: objective function value is 1.508869"
```

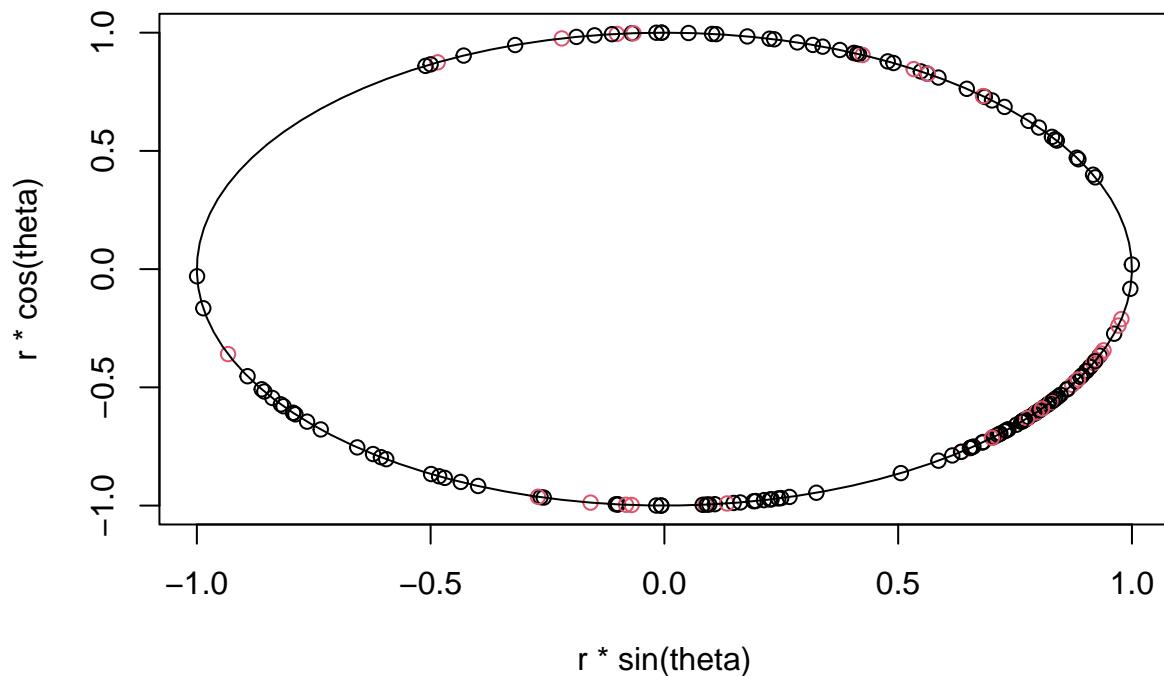


```
## [1] "Iteration 921"
```

```
## [1] "Iteration 922"  
## [1] "Iteration 923"  
## [1] "Iteration 924"  
## [1] "Iteration 925"  
## [1] "Iteration 925: objective function value is 1.555048"
```



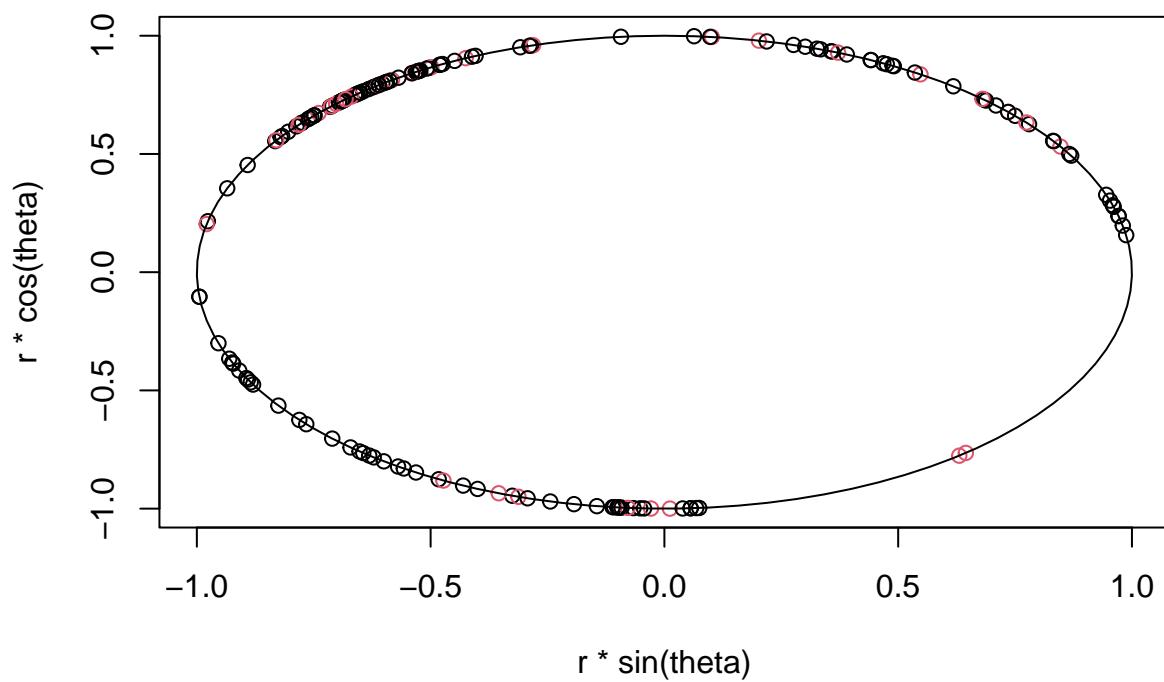
```
## [1] "Iteration 926"  
## [1] "Iteration 927"  
## [1] "Iteration 928"  
## [1] "Iteration 929"  
## [1] "Iteration 930"  
## [1] "Iteration 930: objective function value is 1.499390"
```



```

## [1] "Iteration 931"
## [1] "Iteration 932"
## [1] "Iteration 933"
## [1] "Iteration 934"
## [1] "Iteration 935"
## [1] "Iteration 935: objective function value is 1.545385"

```

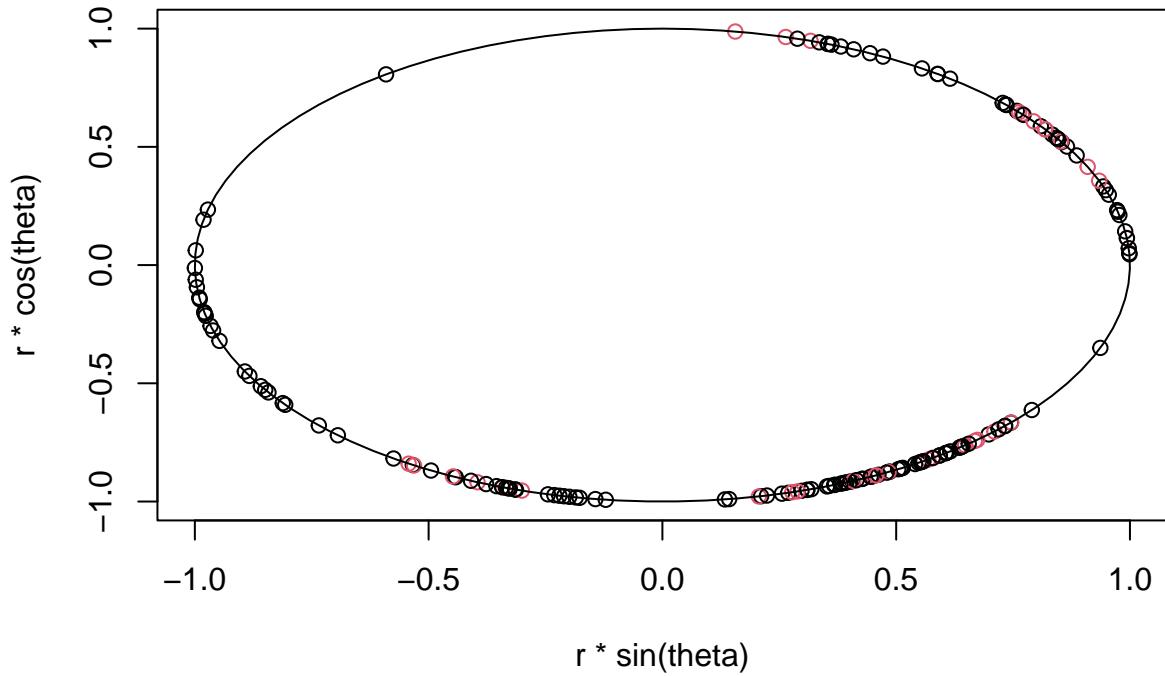


```

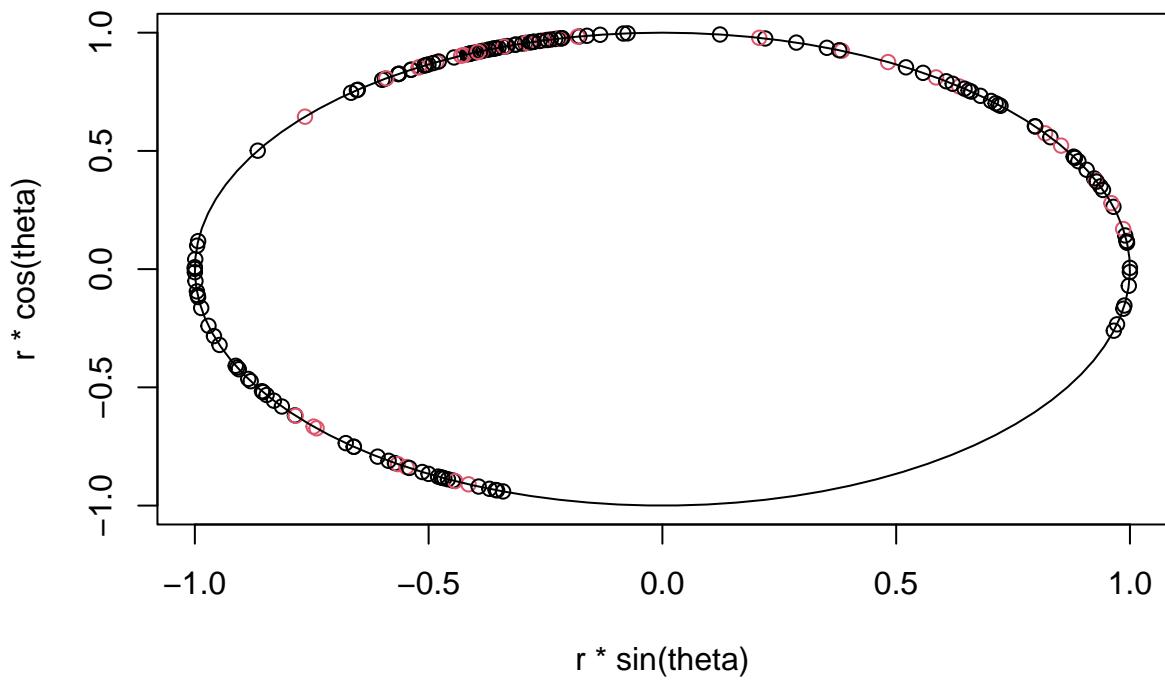
## [1] "Iteration 936"
## [1] "Iteration 937"
## [1] "Iteration 938"
## [1] "Iteration 939"

```

```
## [1] "Iteration 940"  
## [1] "Iteration 940: objective function value is 1.514105"
```

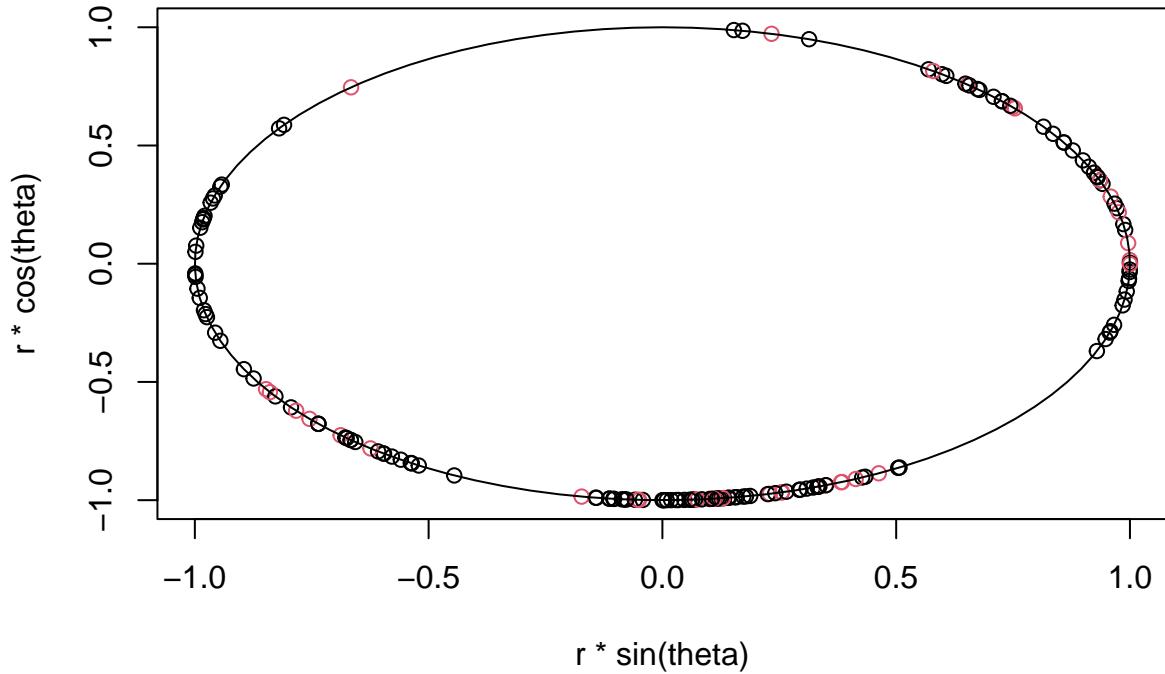


```
## [1] "Iteration 941"  
## [1] "Iteration 942"  
## [1] "Iteration 943"  
## [1] "Iteration 944"  
## [1] "Iteration 945"  
## [1] "Iteration 945: objective function value is 1.498766"
```

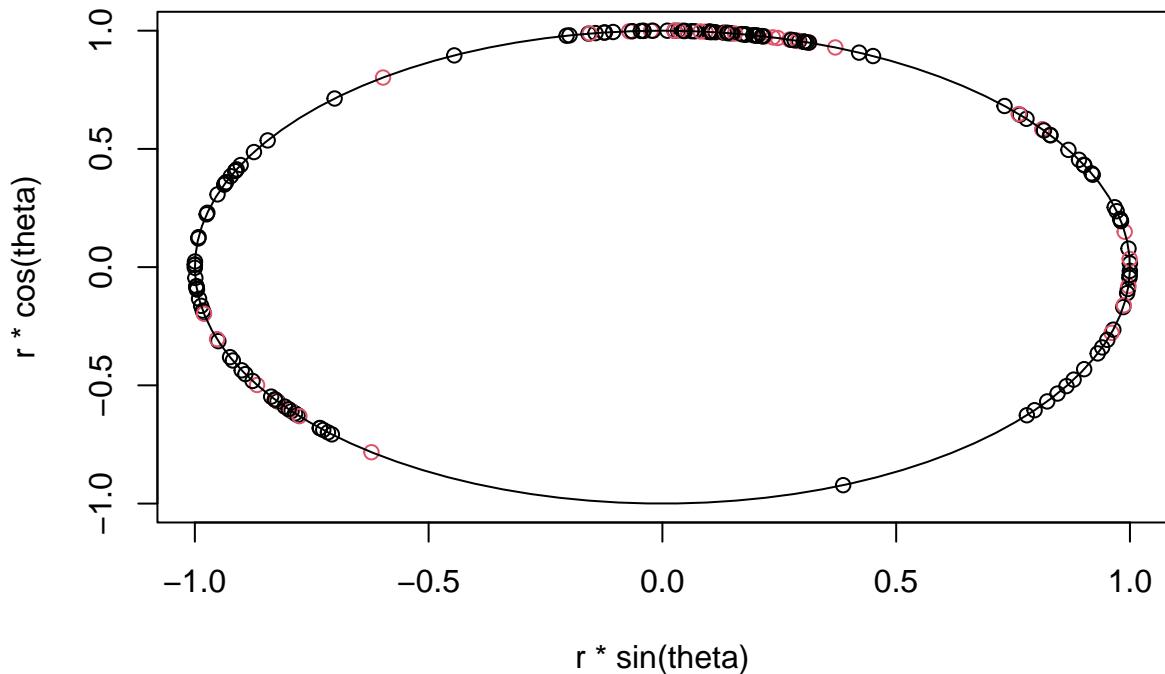


```
## [1] "Iteration 946"
```

```
## [1] "Iteration 947"  
## [1] "Iteration 948"  
## [1] "Iteration 949"  
## [1] "Iteration 950"  
## [1] "Iteration 950: objective function value is 1.491993"
```



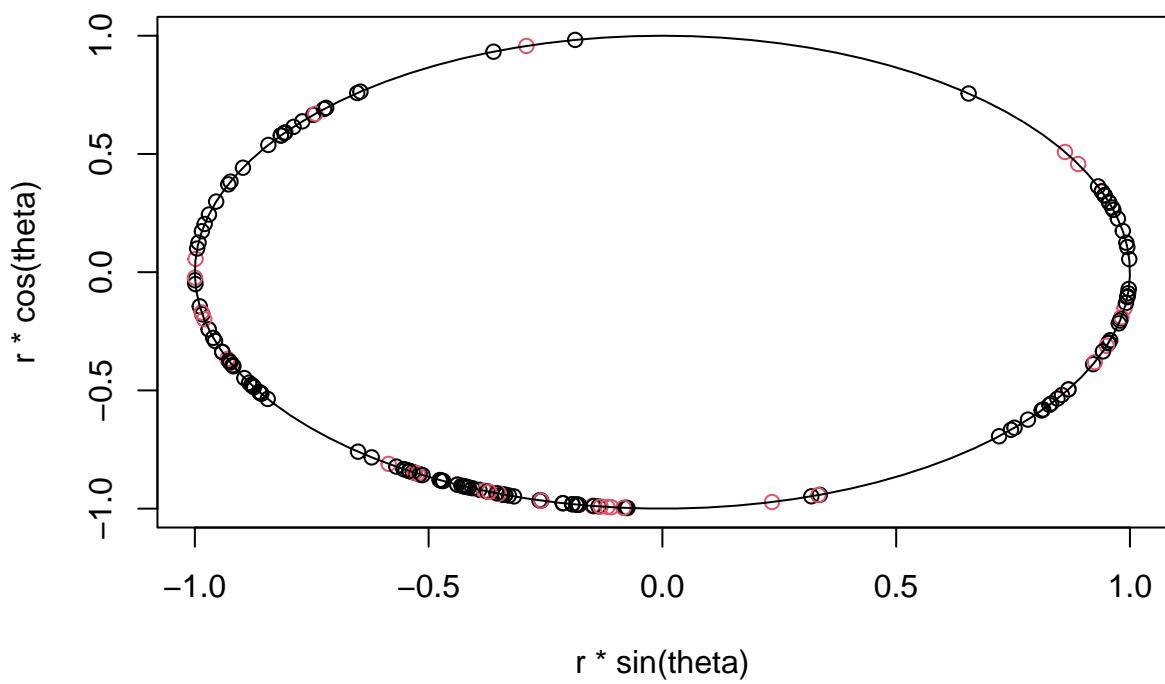
```
## [1] "Iteration 951"  
## [1] "Iteration 952"  
## [1] "Iteration 953"  
## [1] "Iteration 954"  
## [1] "Iteration 955"  
## [1] "Iteration 955: objective function value is 1.531492"
```



```

## [1] "Iteration 956"
## [1] "Iteration 957"
## [1] "Iteration 958"
## [1] "Iteration 959"
## [1] "Iteration 960"
## [1] "Iteration 960: objective function value is 1.518834"

```

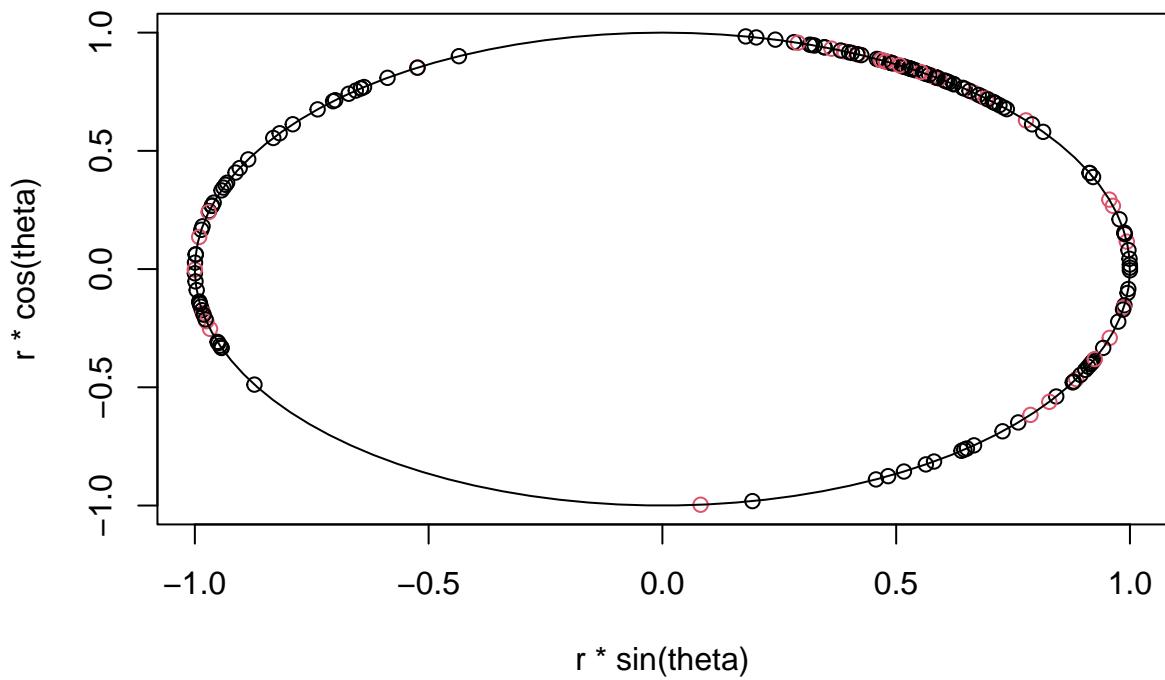


```

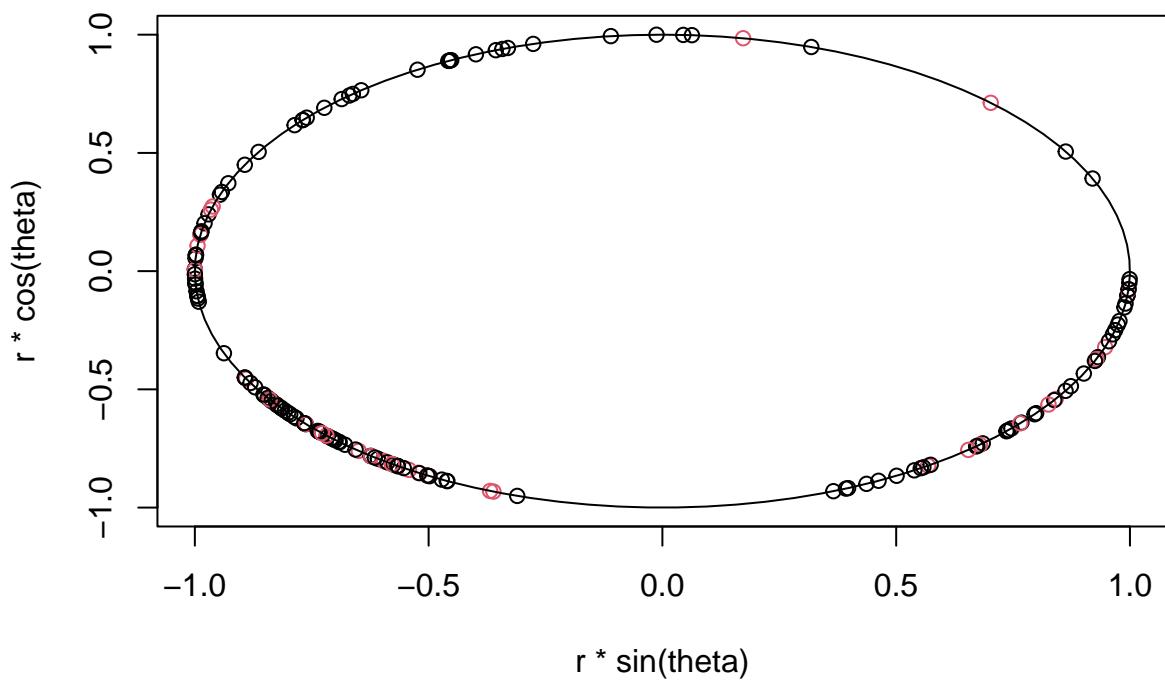
## [1] "Iteration 961"
## [1] "Iteration 962"
## [1] "Iteration 963"
## [1] "Iteration 964"

```

```
## [1] "Iteration 965"  
## [1] "Iteration 965: objective function value is 1.509396"
```

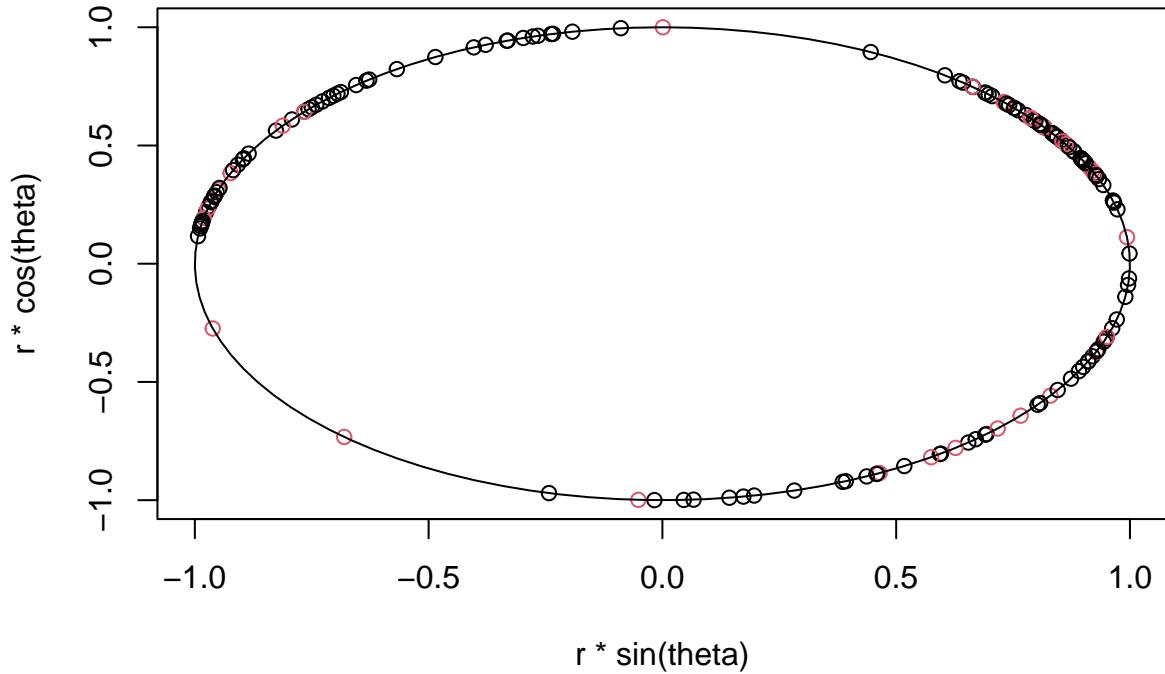


```
## [1] "Iteration 966"  
## [1] "Iteration 967"  
## [1] "Iteration 968"  
## [1] "Iteration 969"  
## [1] "Iteration 970"  
## [1] "Iteration 970: objective function value is 1.521475"
```

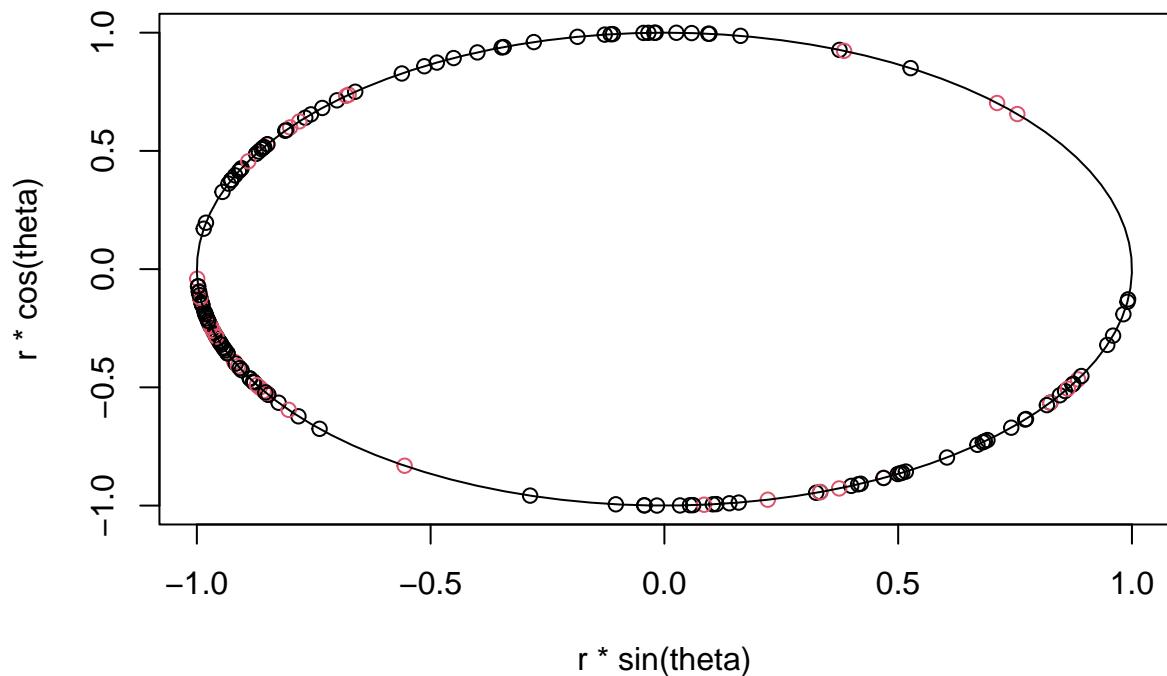


```
## [1] "Iteration 971"
```

```
## [1] "Iteration 972"  
## [1] "Iteration 973"  
## [1] "Iteration 974"  
## [1] "Iteration 975"  
## [1] "Iteration 975: objective function value is 1.514289"
```



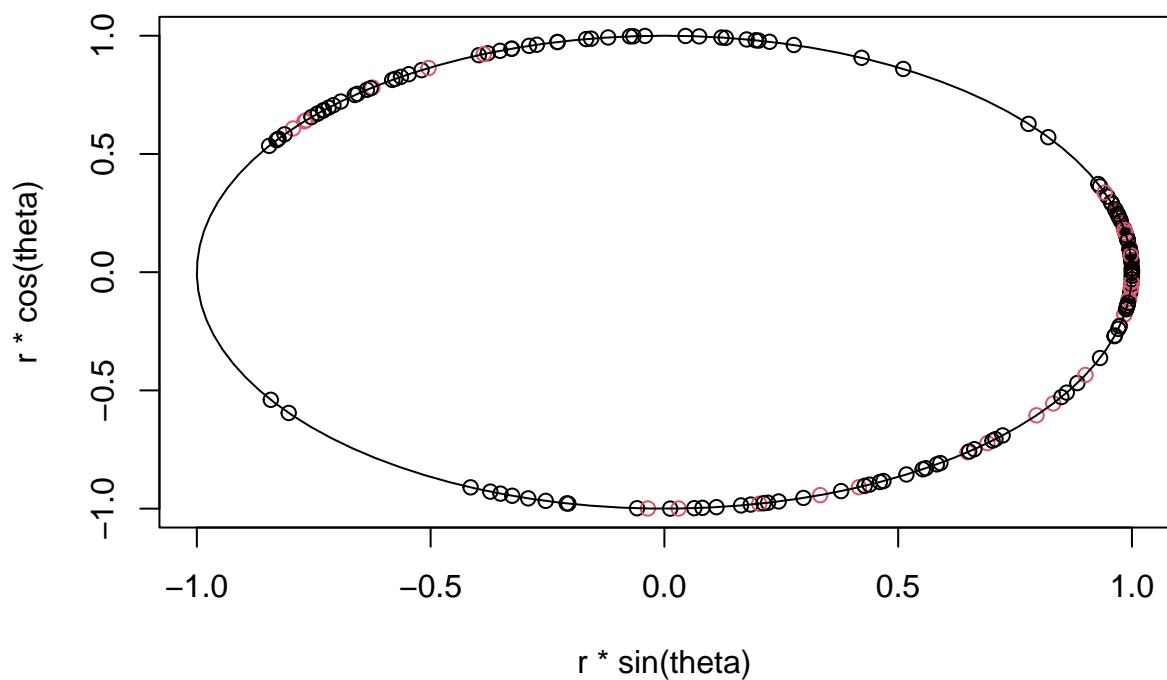
```
## [1] "Iteration 976"  
## [1] "Iteration 977"  
## [1] "Iteration 978"  
## [1] "Iteration 979"  
## [1] "Iteration 980"  
## [1] "Iteration 980: objective function value is 1.524932"
```



```

## [1] "Iteration 981"
## [1] "Iteration 982"
## [1] "Iteration 983"
## [1] "Iteration 984"
## [1] "Iteration 985"
## [1] "Iteration 985: objective function value is 1.507473"

```

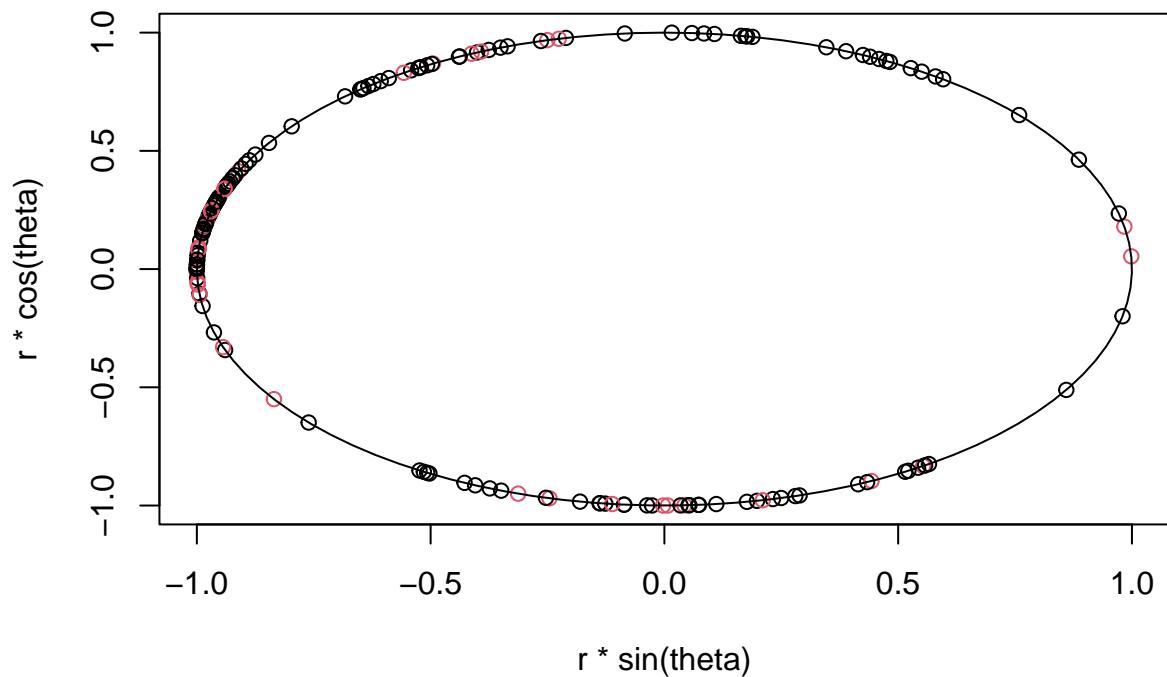


```

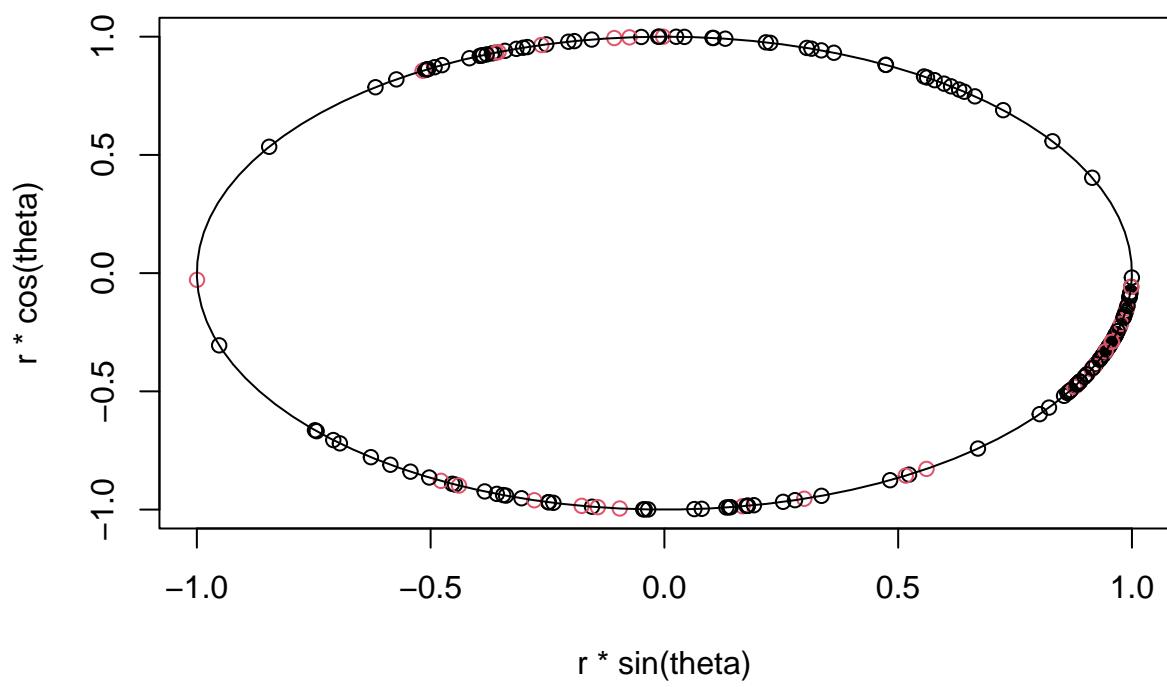
## [1] "Iteration 986"
## [1] "Iteration 987"
## [1] "Iteration 988"
## [1] "Iteration 989"

```

```
## [1] "Iteration 990"  
## [1] "Iteration 990: objective function value is 1.534564"
```



```
## [1] "Iteration 991"  
## [1] "Iteration 992"  
## [1] "Iteration 993"  
## [1] "Iteration 994"  
## [1] "Iteration 995"  
## [1] "Iteration 995: objective function value is 1.543843"
```

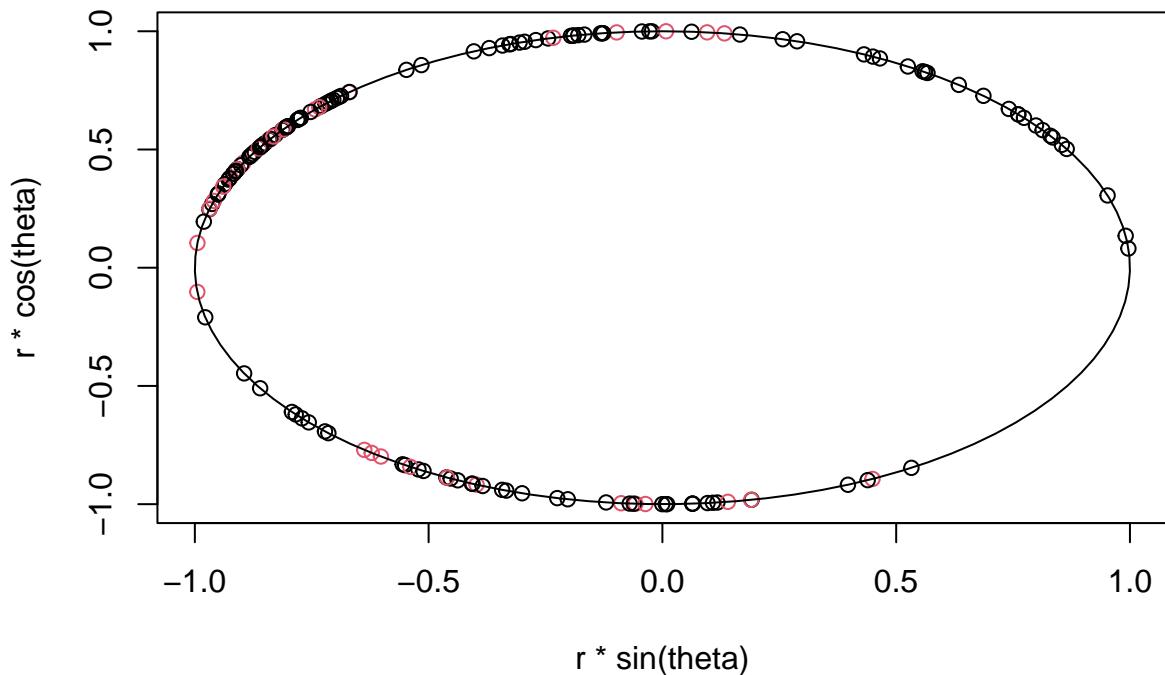


```
## [1] "Iteration 996"
```

```

## [1] "Iteration 997"
## [1] "Iteration 998"
## [1] "Iteration 999"
## [1] "Iteration 1000"
## [1] "Iteration 1000: objective function value is 1.509792"

```

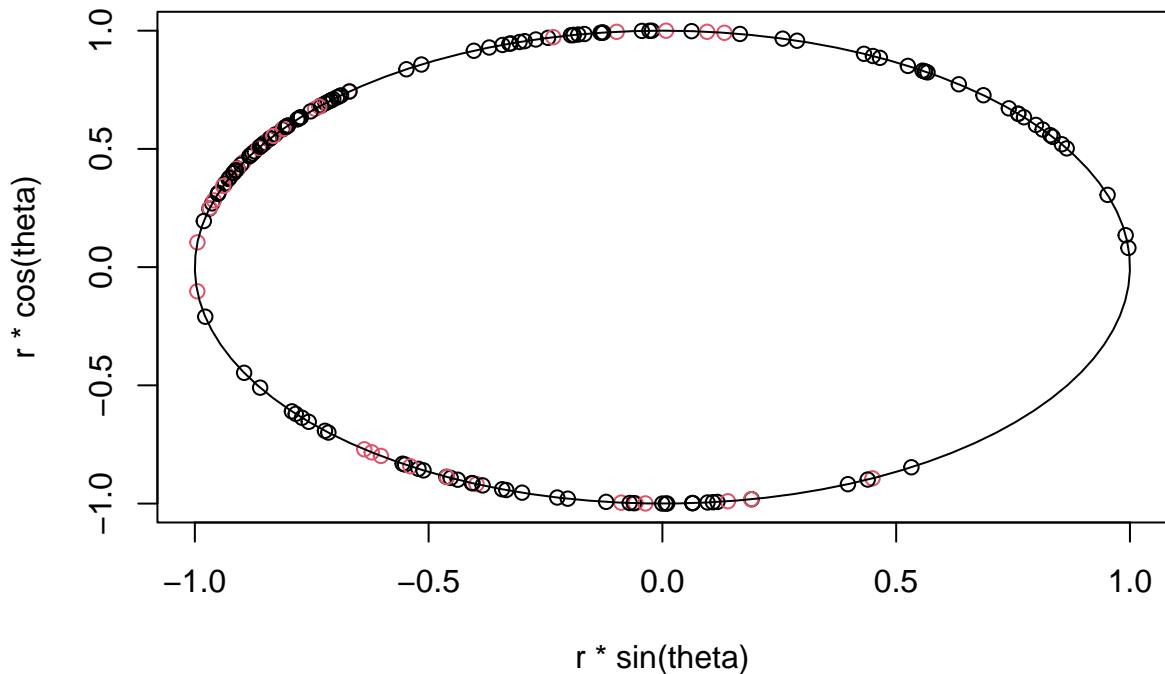


```

Y_rad <- DirStats::to_rad(Y[, , 1002])
r <- 1
theta <- Y_rad
plot(r*sin(theta),
      r*cos(theta),
      col=ifelse(ids_labs, 2, 1),
      xlim=c(-max(r), max(r)),
      ylim=c(-max(r), max(r)))

polygon(max(r)*sin(seq(0, 2*pi, length.out=100)), max(r)*cos(seq(0, 2*pi, length.out=100)))

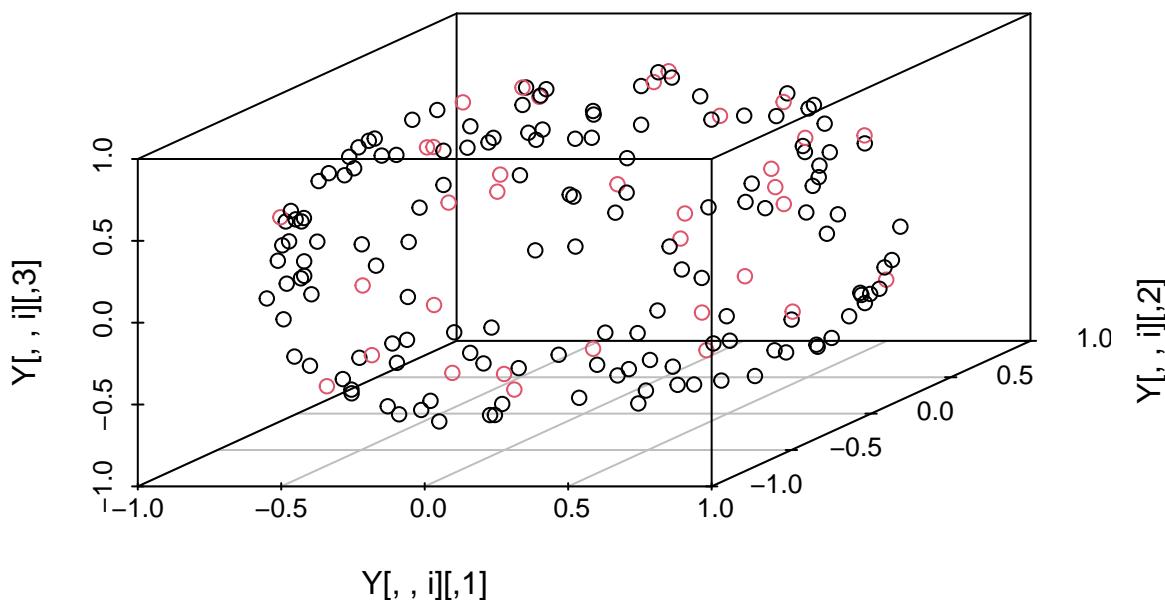
```



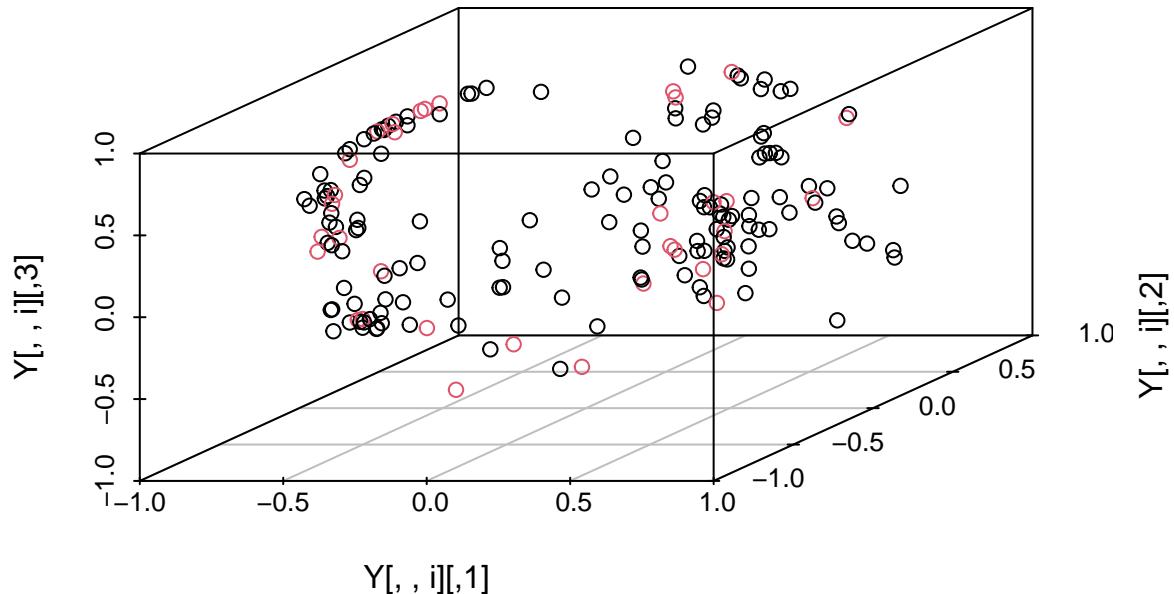
Now we are going to reduce to dimension \mathbb{S}^2 then $d = 2$ (sphere):

```
Y <- psc_sne(spokes, d=2, rho_psc_list = rho_spokes_perp30, colors = ifelse(ids_labs, 2, 1), num_iterat...  
visualize_prog = TRUE)
```

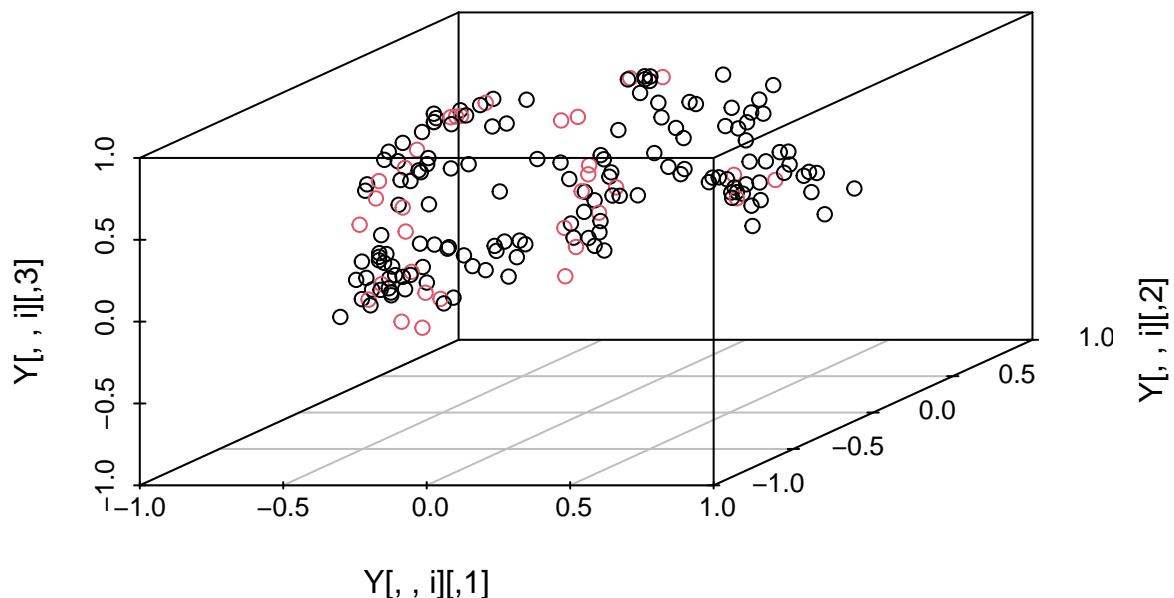
```
## [1] "Iteration 1"  
## [1] "Iteration 1: objective function value is 14.307227"
```



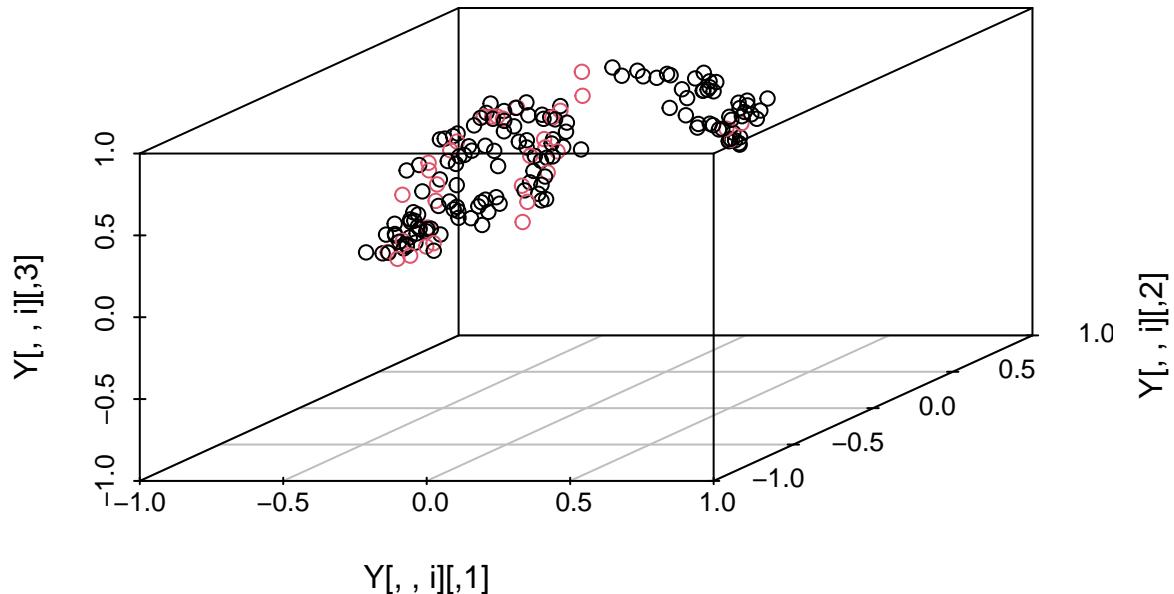
```
## [1] "Iteration 2"  
## [1] "Iteration 3"  
## [1] "Iteration 4"  
## [1] "Iteration 5"  
## [1] "Iteration 5: objective function value is 9.937385"
```



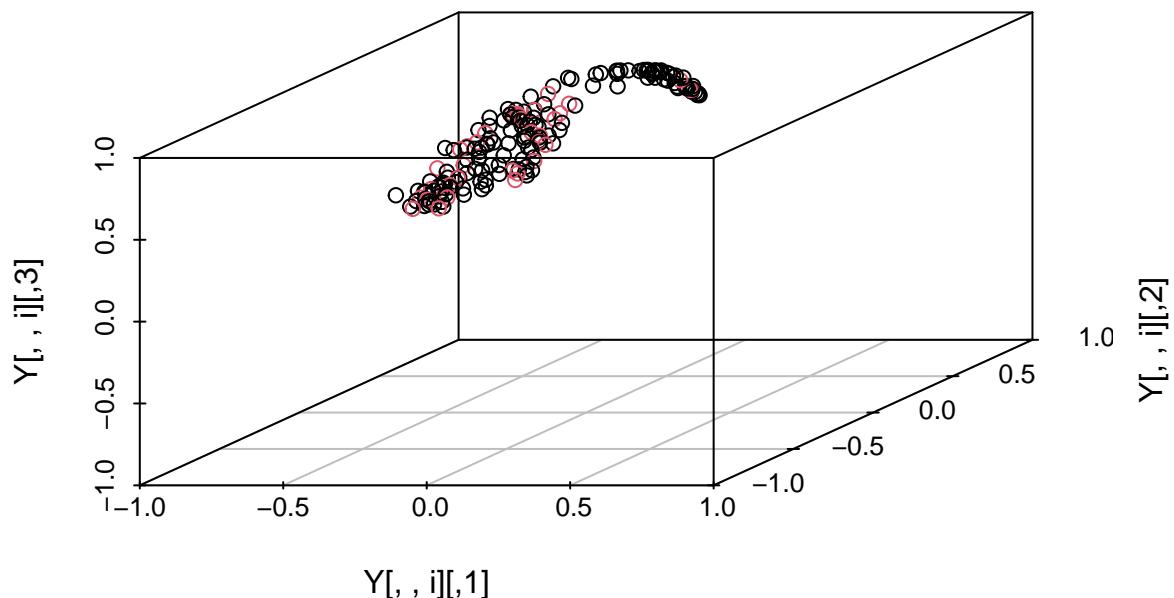
```
## [1] "Iteration 6"
## [1] "Iteration 7"
## [1] "Iteration 8"
## [1] "Iteration 9"
## [1] "Iteration 10"
## [1] "Iteration 10: objective function value is 9.906773"
```



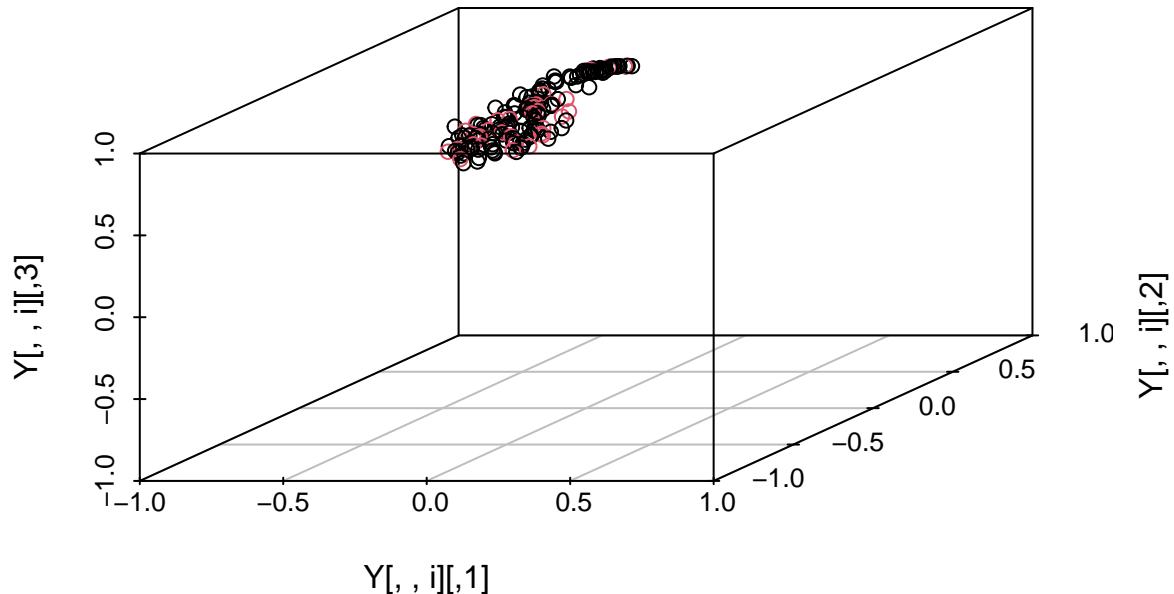
```
## [1] "Iteration 11"
## [1] "Iteration 12"
## [1] "Iteration 13"
## [1] "Iteration 14"
## [1] "Iteration 15"
## [1] "Iteration 15: objective function value is 10.429690"
```



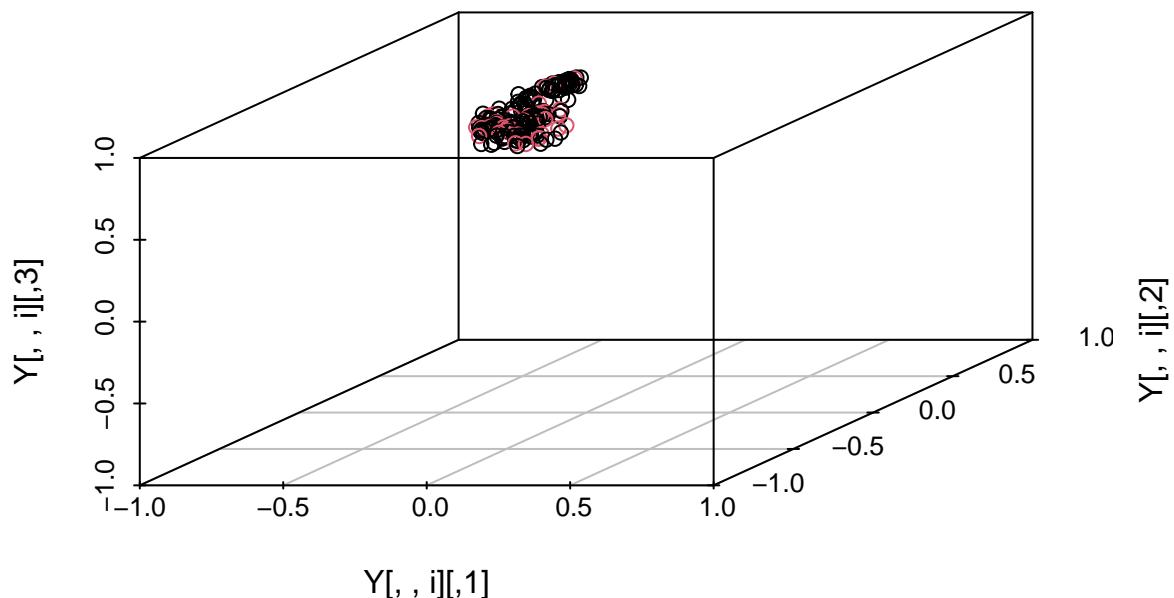
```
## [1] "Iteration 16"
## [1] "Iteration 17"
## [1] "Iteration 18"
## [1] "Iteration 19"
## [1] "Iteration 20"
## [1] "Iteration 20: objective function value is 10.520108"
```



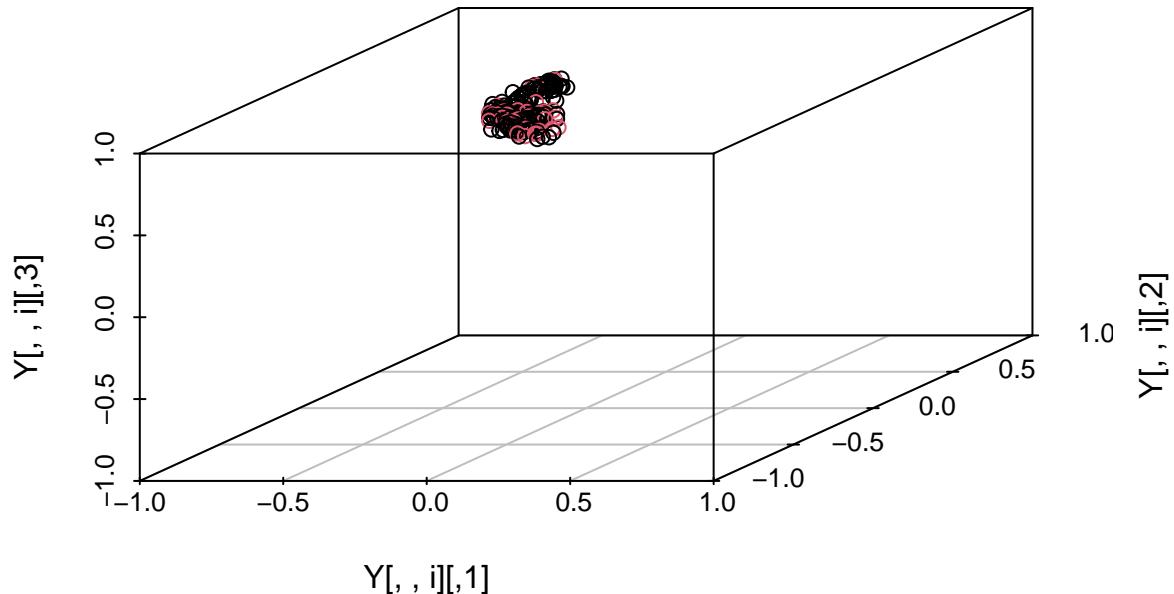
```
## [1] "Iteration 21"
## [1] "Iteration 22"
## [1] "Iteration 23"
## [1] "Iteration 24"
## [1] "Iteration 25"
## [1] "Iteration 25: objective function value is 10.801914"
```



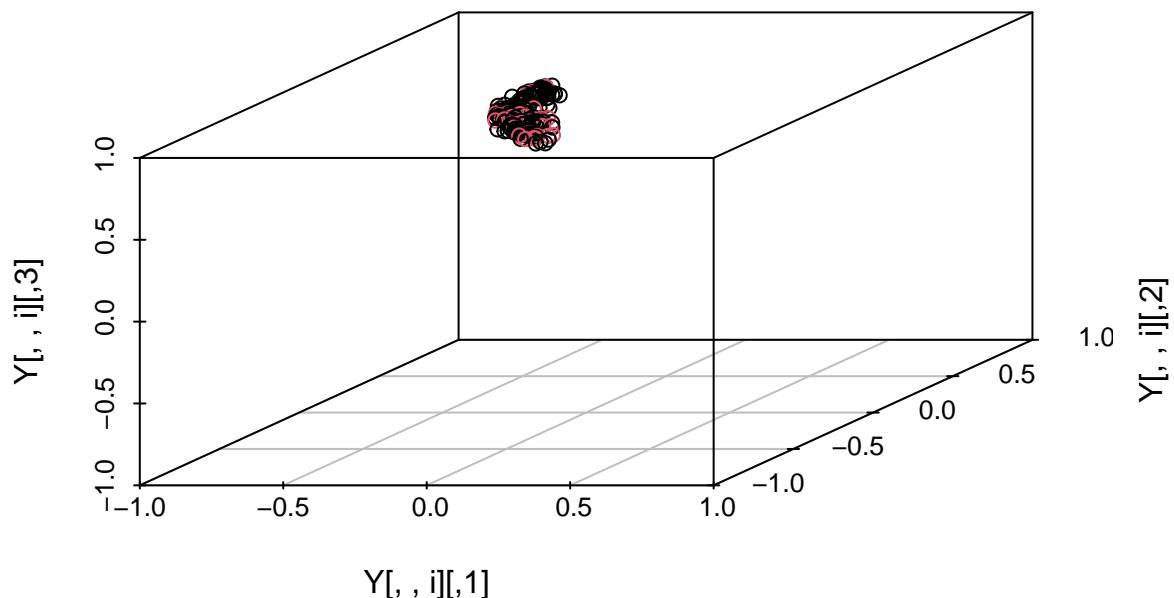
```
## [1] "Iteration 26"
## [1] "Iteration 27"
## [1] "Iteration 28"
## [1] "Iteration 29"
## [1] "Iteration 30"
## [1] "Iteration 30: objective function value is 11.184429"
```



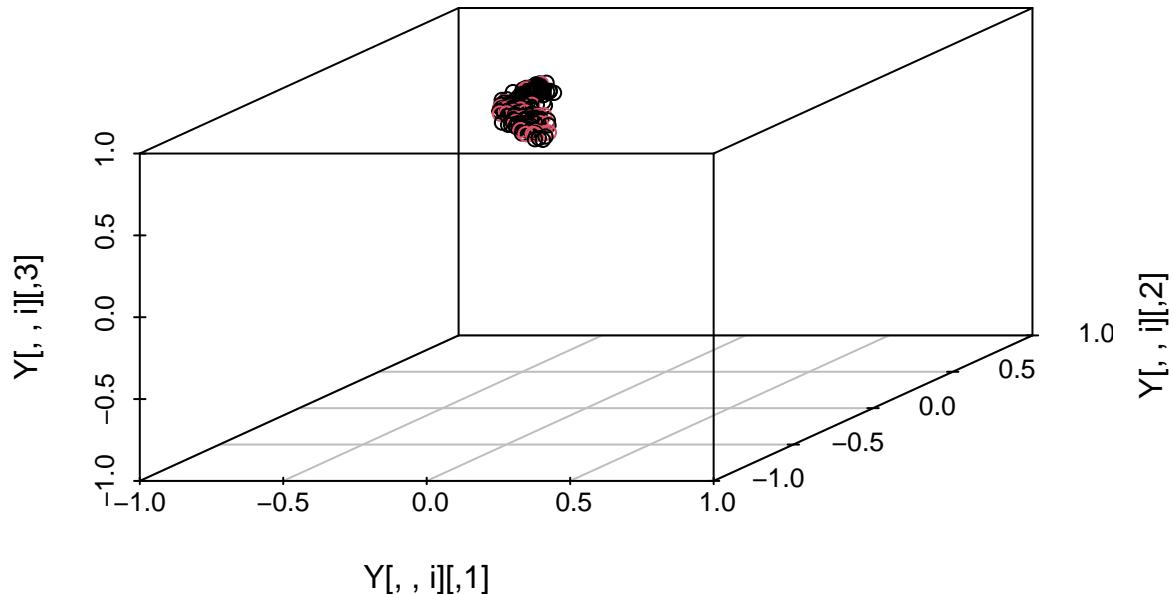
```
## [1] "Iteration 31"
## [1] "Iteration 32"
## [1] "Iteration 33"
## [1] "Iteration 34"
## [1] "Iteration 35"
## [1] "Iteration 35: objective function value is 11.333764"
```



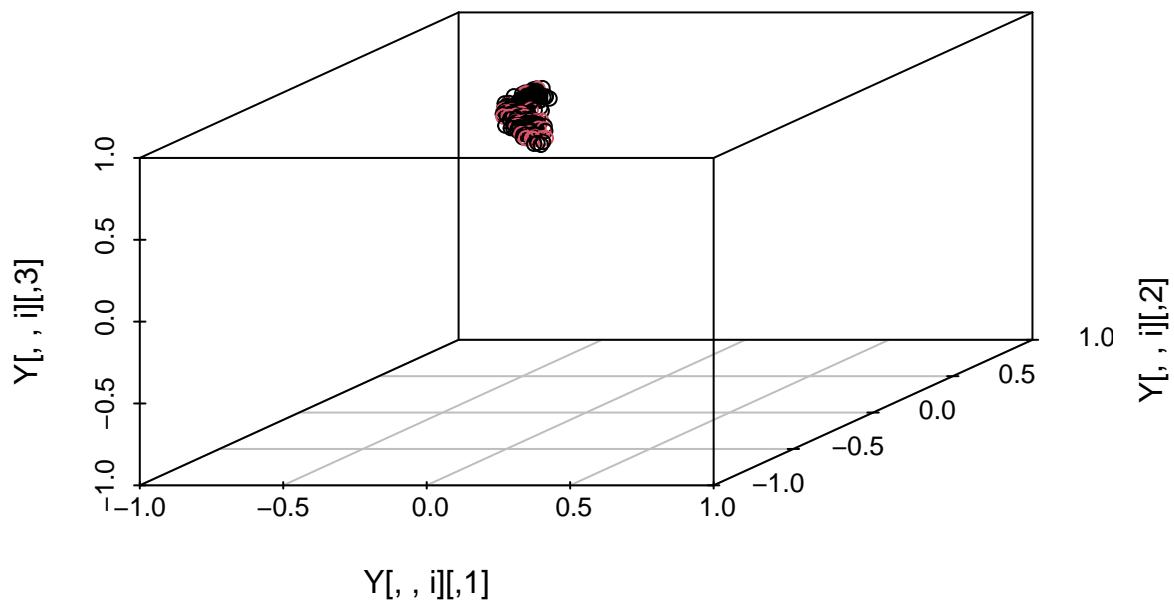
```
## [1] "Iteration 36"
## [1] "Iteration 37"
## [1] "Iteration 38"
## [1] "Iteration 39"
## [1] "Iteration 40"
## [1] "Iteration 40: objective function value is 11.383604"
```



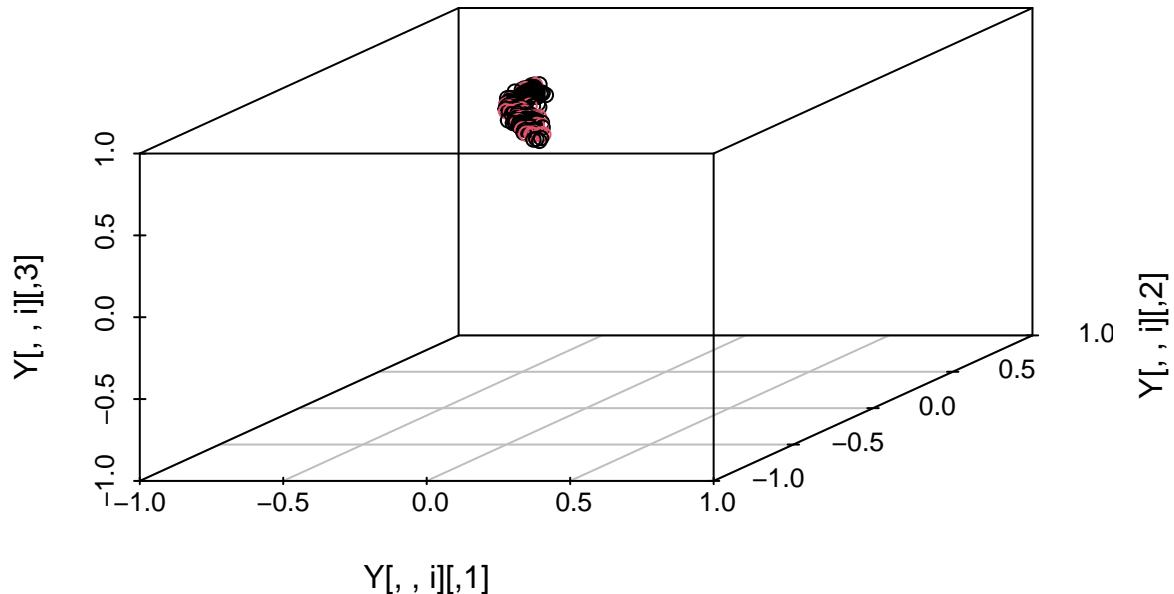
```
## [1] "Iteration 41"
## [1] "Iteration 42"
## [1] "Iteration 43"
## [1] "Iteration 44"
## [1] "Iteration 45"
## [1] "Iteration 45: objective function value is 11.404208"
```



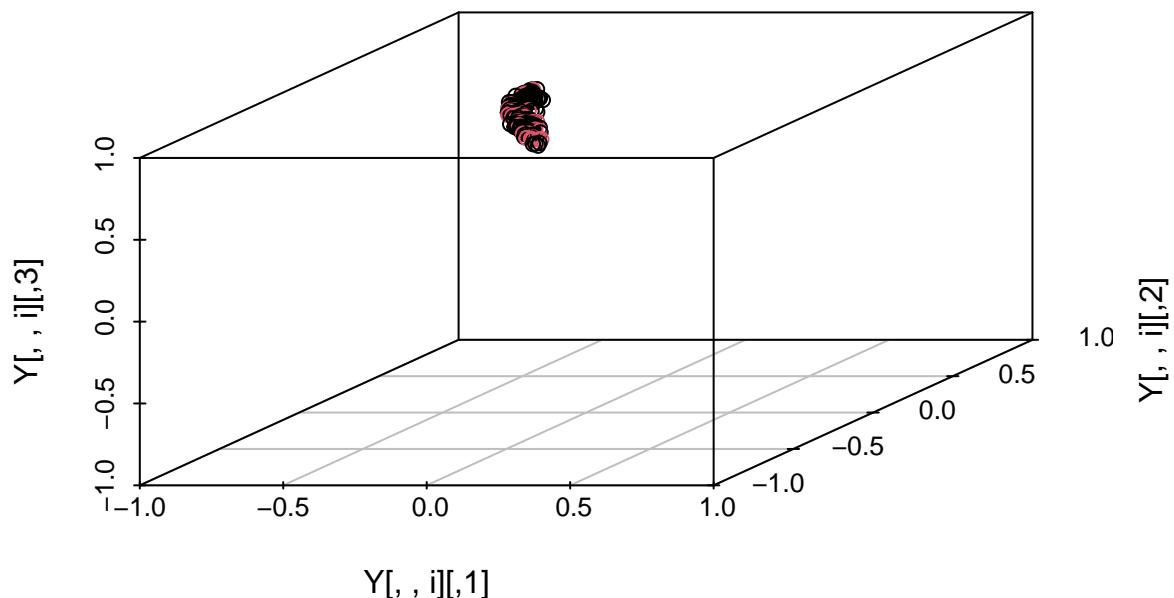
```
## [1] "Iteration 46"
## [1] "Iteration 47"
## [1] "Iteration 48"
## [1] "Iteration 49"
## [1] "Iteration 50"
## [1] "Iteration 50: objective function value is 11.414659"
```



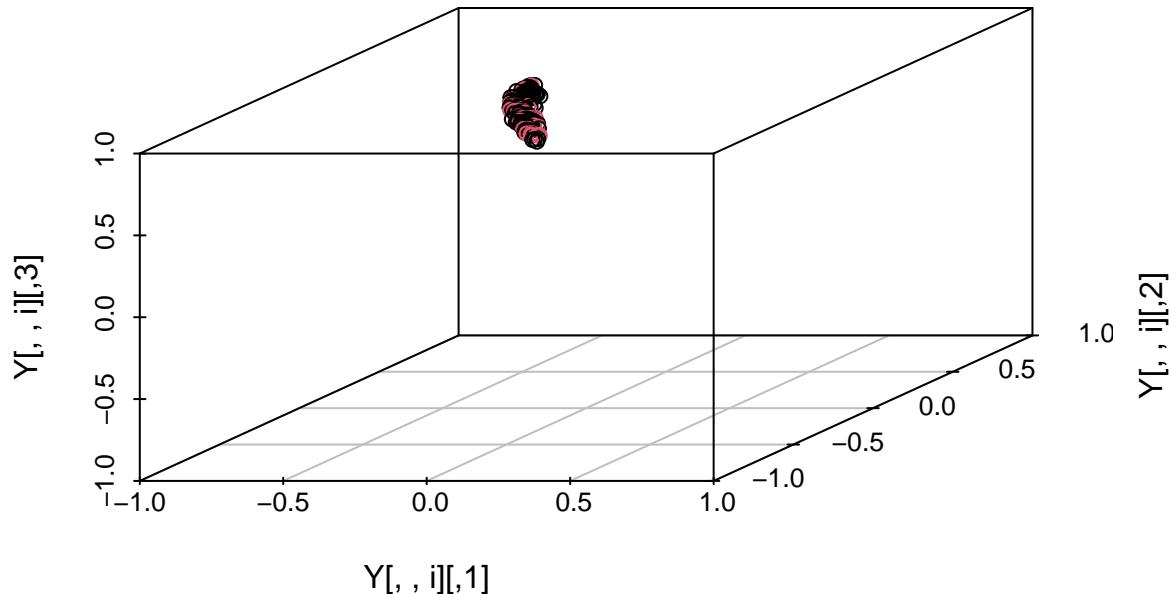
```
## [1] "Iteration 51"
## [1] "Iteration 52"
## [1] "Iteration 53"
## [1] "Iteration 54"
## [1] "Iteration 55"
## [1] "Iteration 55: objective function value is 11.420798"
```



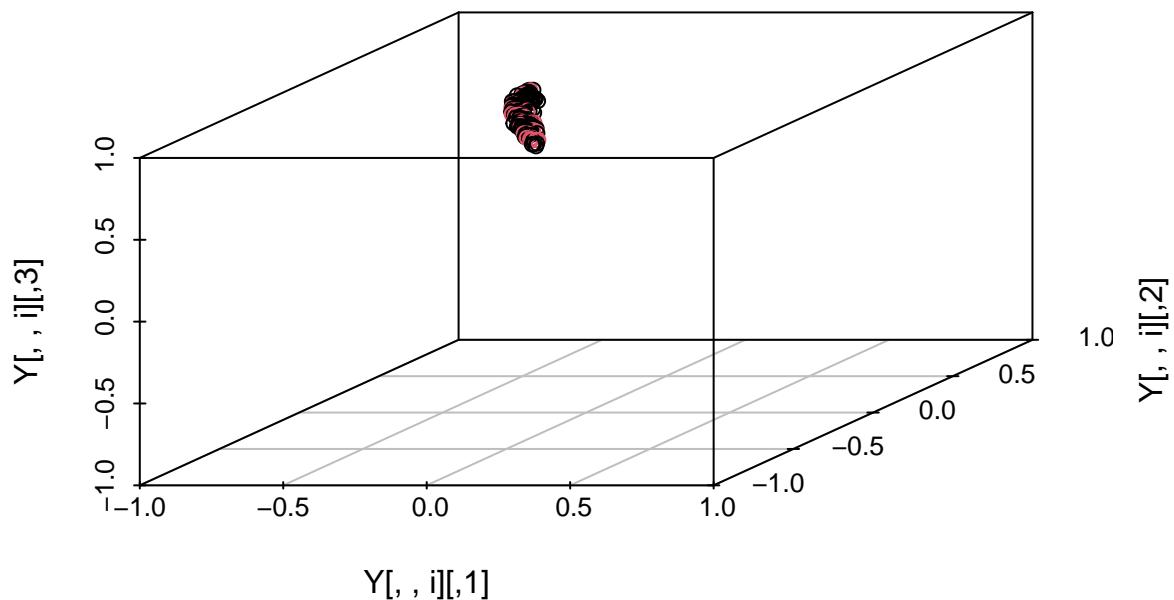
```
## [1] "Iteration 56"
## [1] "Iteration 57"
## [1] "Iteration 58"
## [1] "Iteration 59"
## [1] "Iteration 60"
## [1] "Iteration 60: objective function value is 11.424778"
```



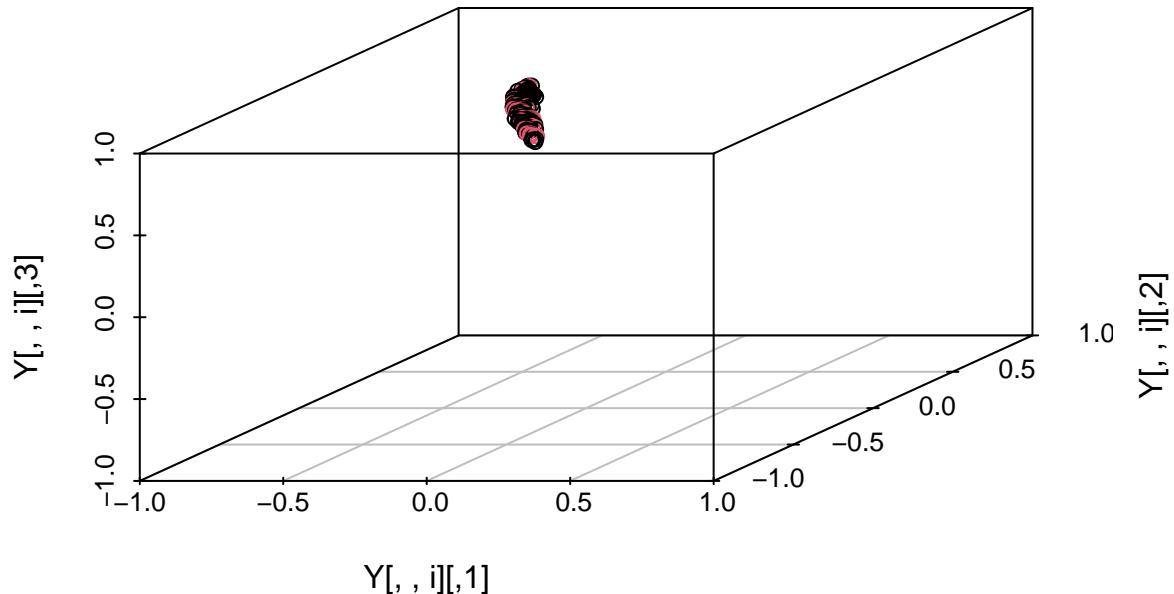
```
## [1] "Iteration 61"
## [1] "Iteration 62"
## [1] "Iteration 63"
## [1] "Iteration 64"
## [1] "Iteration 65"
## [1] "Iteration 65: objective function value is 11.427533"
```



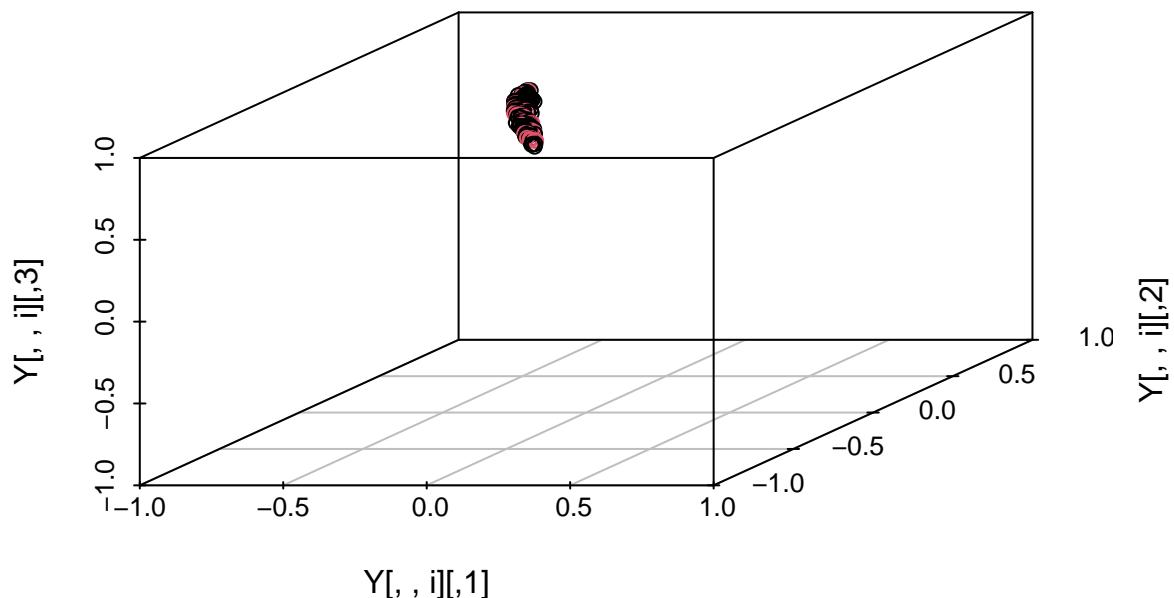
```
## [1] "Iteration 66"
## [1] "Iteration 67"
## [1] "Iteration 68"
## [1] "Iteration 69"
## [1] "Iteration 70"
## [1] "Iteration 70: objective function value is 11.429521"
```



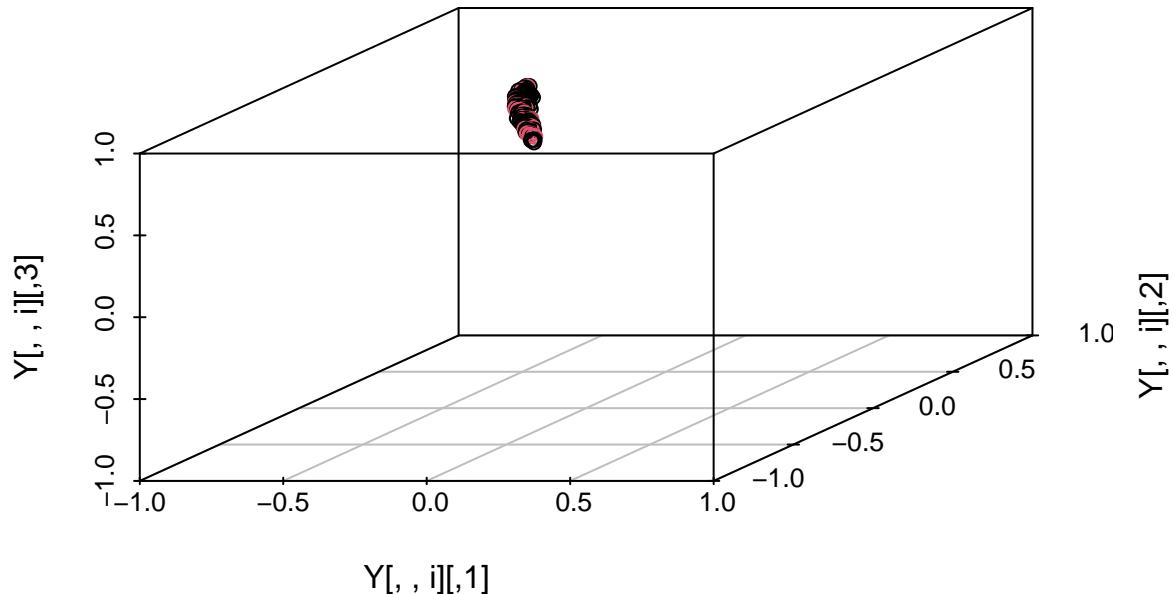
```
## [1] "Iteration 71"
## [1] "Iteration 72"
## [1] "Iteration 73"
## [1] "Iteration 74"
## [1] "Iteration 75"
## [1] "Iteration 75: objective function value is 11.430997"
```



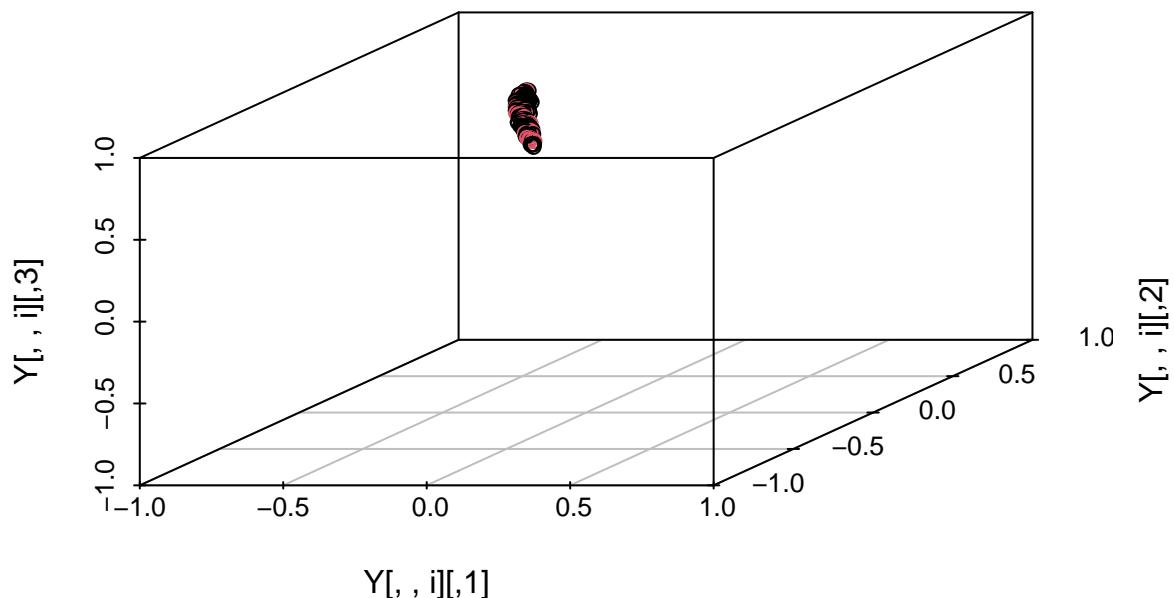
```
## [1] "Iteration 76"
## [1] "Iteration 77"
## [1] "Iteration 78"
## [1] "Iteration 79"
## [1] "Iteration 80"
## [1] "Iteration 80: objective function value is 11.432111"
```



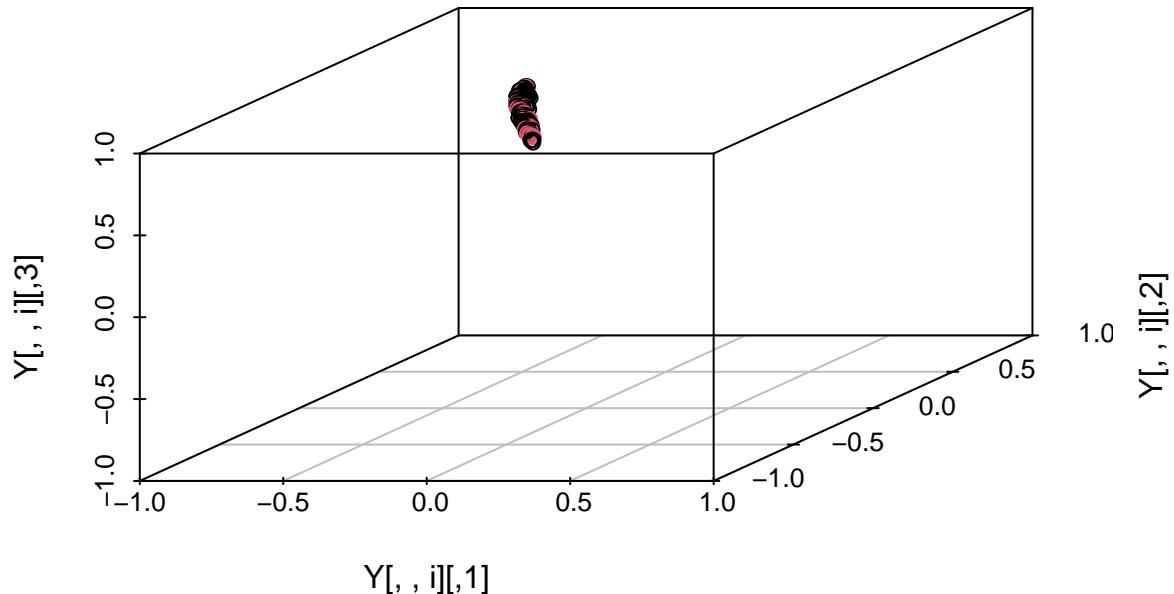
```
## [1] "Iteration 81"
## [1] "Iteration 82"
## [1] "Iteration 83"
## [1] "Iteration 84"
## [1] "Iteration 85"
## [1] "Iteration 85: objective function value is 11.432962"
```



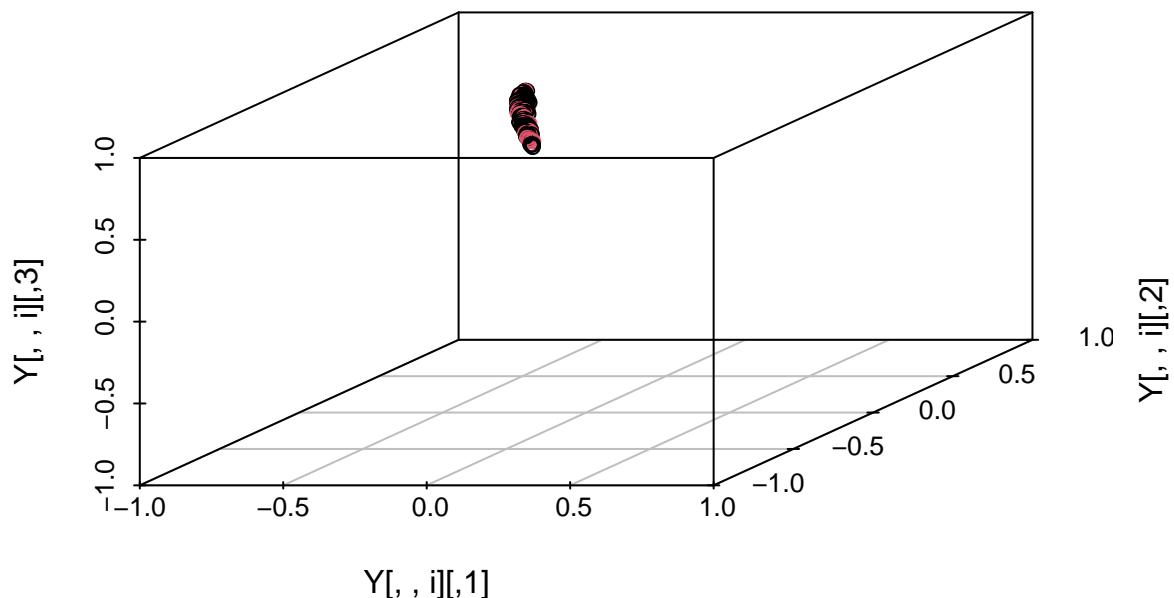
```
## [1] "Iteration 86"
## [1] "Iteration 87"
## [1] "Iteration 88"
## [1] "Iteration 89"
## [1] "Iteration 90"
## [1] "Iteration 90: objective function value is 11.433616"
```



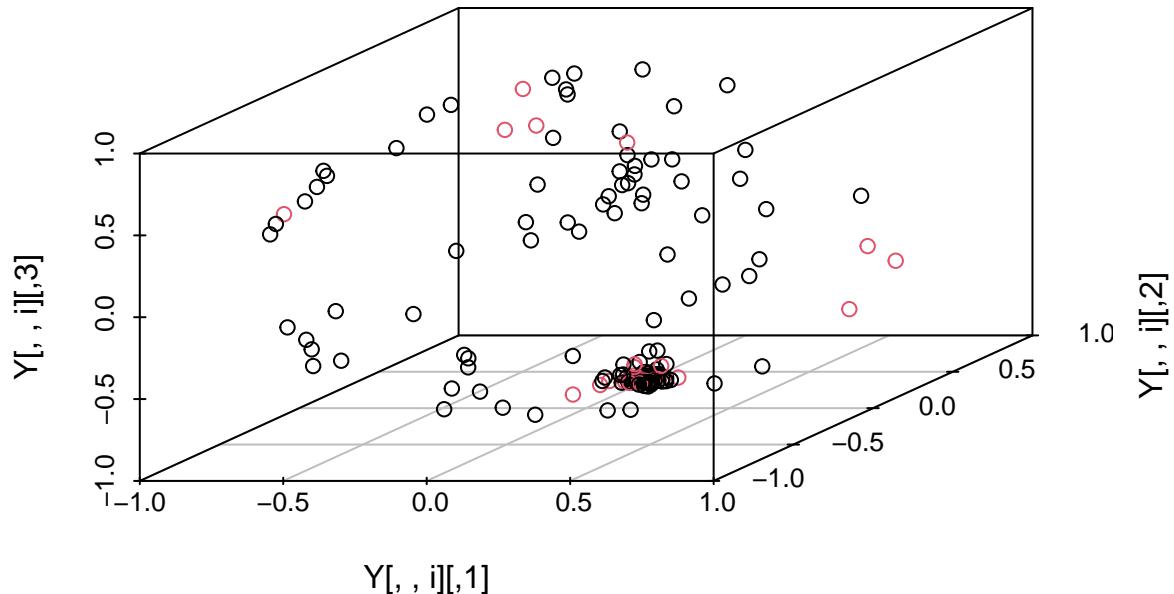
```
## [1] "Iteration 91"
## [1] "Iteration 92"
## [1] "Iteration 93"
## [1] "Iteration 94"
## [1] "Iteration 95"
## [1] "Iteration 95: objective function value is 11.434121"
```



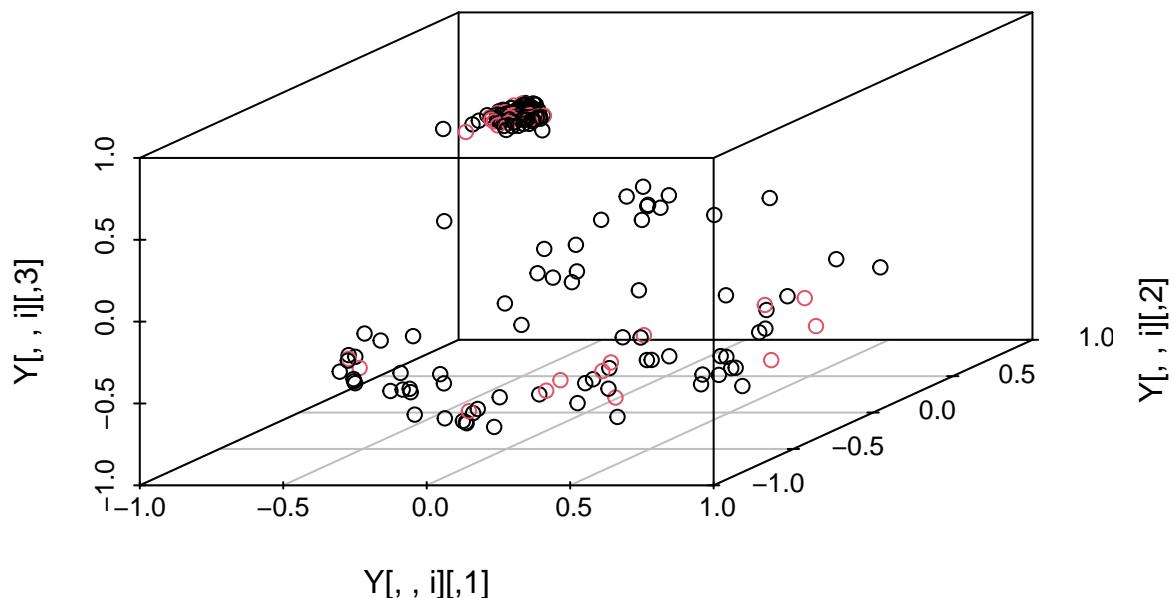
```
## [1] "Iteration 96"
## [1] "Iteration 97"
## [1] "Iteration 98"
## [1] "Iteration 99"
## [1] "Iteration 100"
## [1] "Iteration 100: objective function value is 1.472334"
```



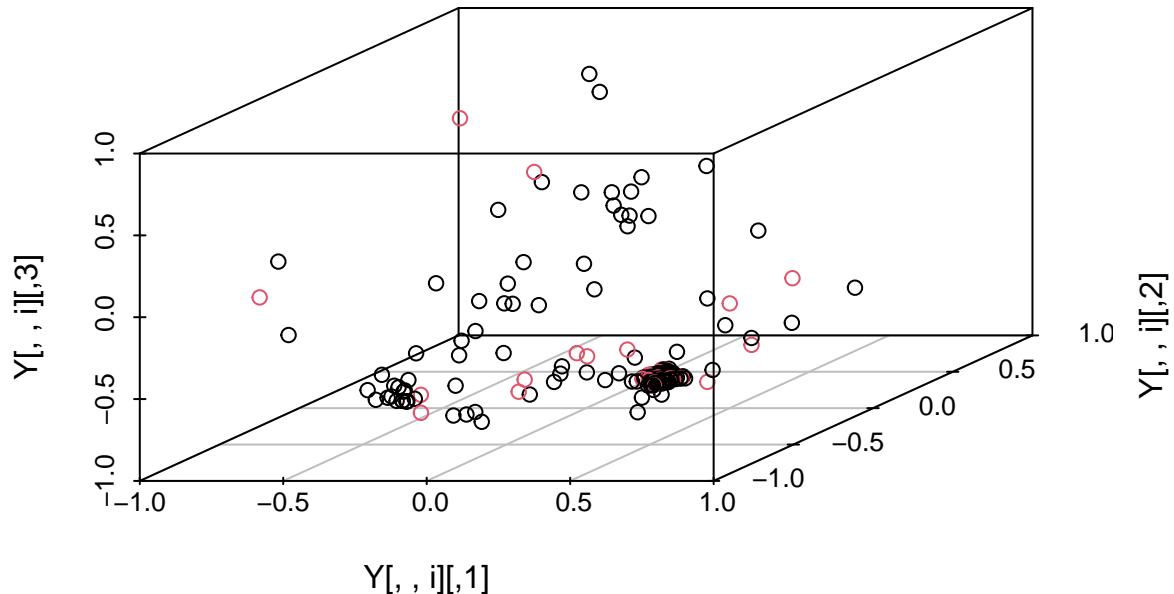
```
## [1] "Iteration 101"
## [1] "Iteration 102"
## [1] "Iteration 103"
## [1] "Iteration 104"
## [1] "Iteration 105"
## [1] "Iteration 105: objective function value is 2.490873"
```



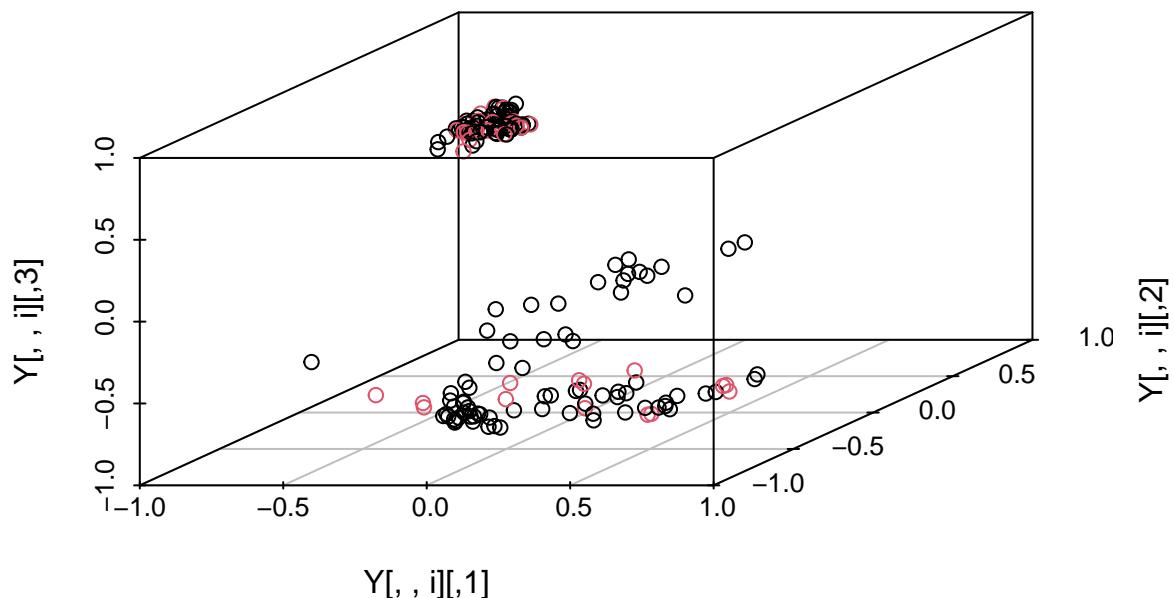
```
## [1] "Iteration 106"
## [1] "Iteration 107"
## [1] "Iteration 108"
## [1] "Iteration 109"
## [1] "Iteration 110"
## [1] "Iteration 110: objective function value is 2.516946"
```



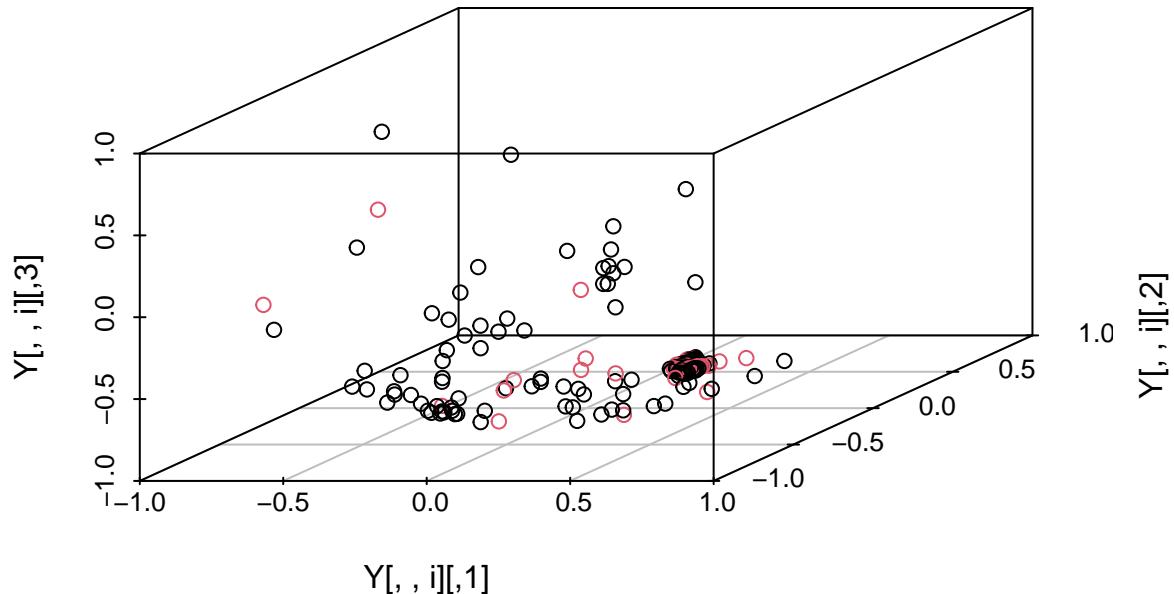
```
## [1] "Iteration 111"
## [1] "Iteration 112"
## [1] "Iteration 113"
## [1] "Iteration 114"
## [1] "Iteration 115"
## [1] "Iteration 115: objective function value is 2.044456"
```



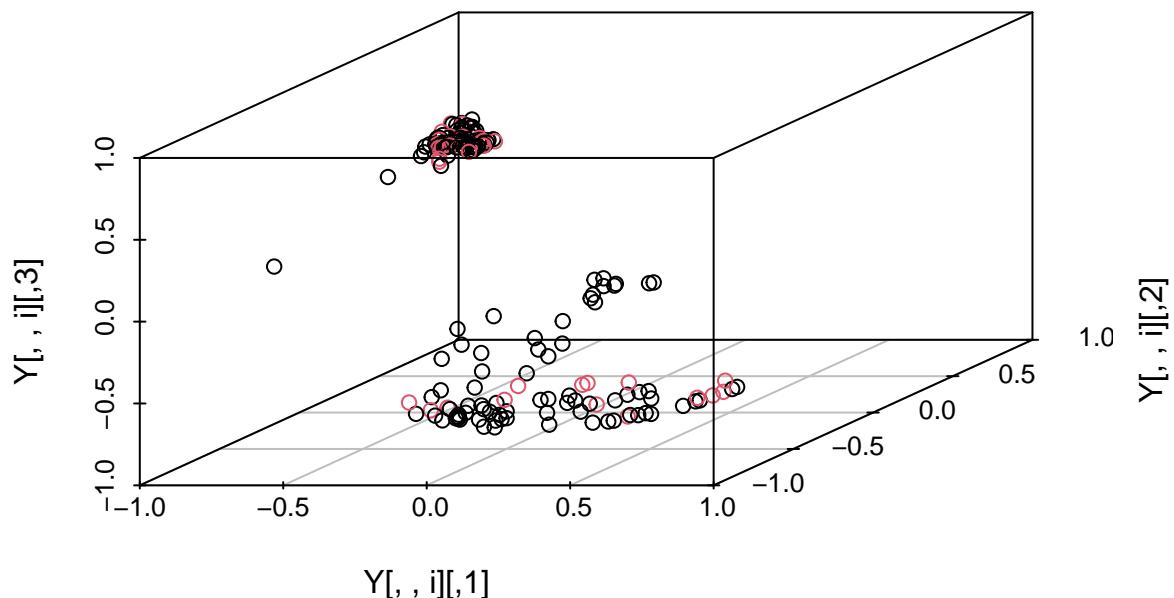
```
## [1] "Iteration 116"
## [1] "Iteration 117"
## [1] "Iteration 118"
## [1] "Iteration 119"
## [1] "Iteration 120"
## [1] "Iteration 120: objective function value is 2.496909"
```



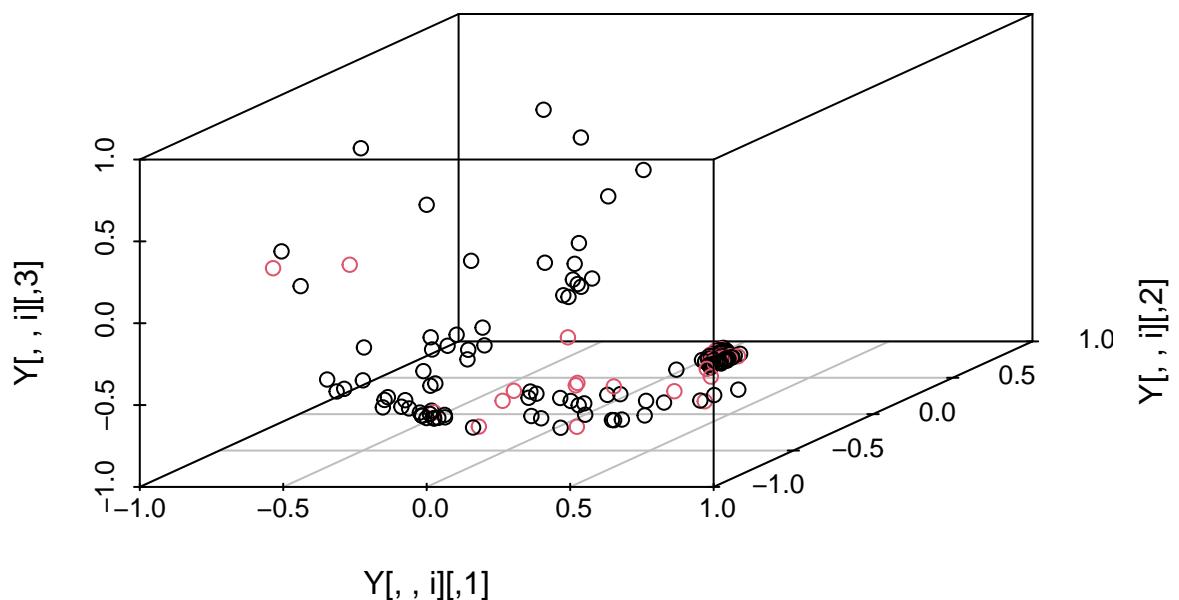
```
## [1] "Iteration 121"
## [1] "Iteration 122"
## [1] "Iteration 123"
## [1] "Iteration 124"
## [1] "Iteration 125"
## [1] "Iteration 125: objective function value is 1.930406"
```



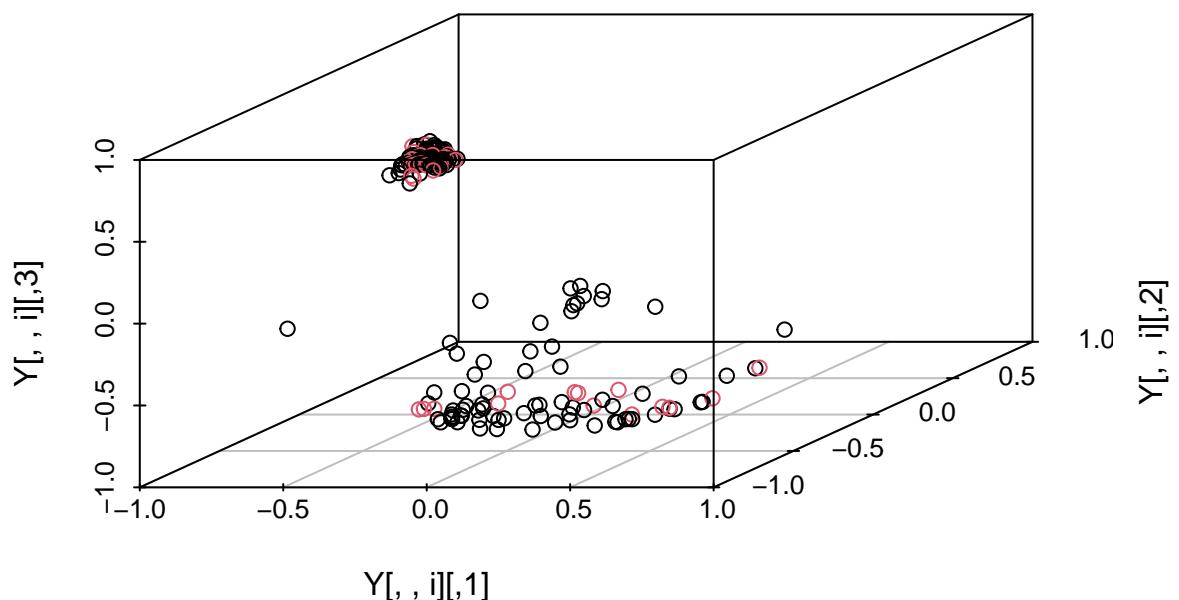
```
## [1] "Iteration 126"
## [1] "Iteration 127"
## [1] "Iteration 128"
## [1] "Iteration 129"
## [1] "Iteration 130"
## [1] "Iteration 130: objective function value is 2.508617"
```



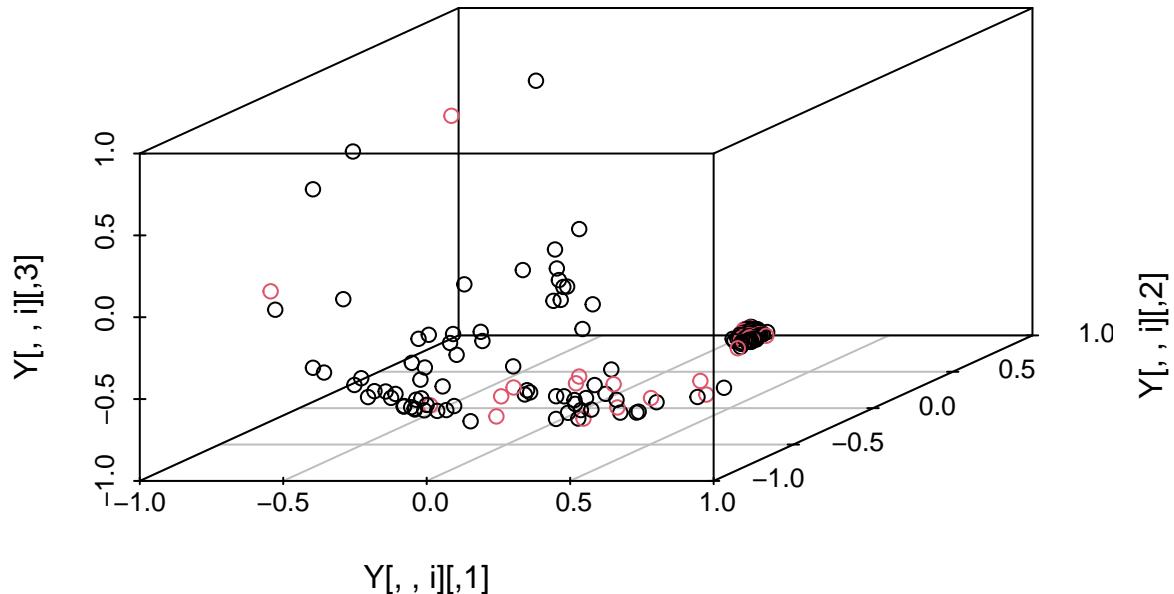
```
## [1] "Iteration 131"
## [1] "Iteration 132"
## [1] "Iteration 133"
## [1] "Iteration 134"
## [1] "Iteration 135"
## [1] "Iteration 135: objective function value is 2.056753"
```



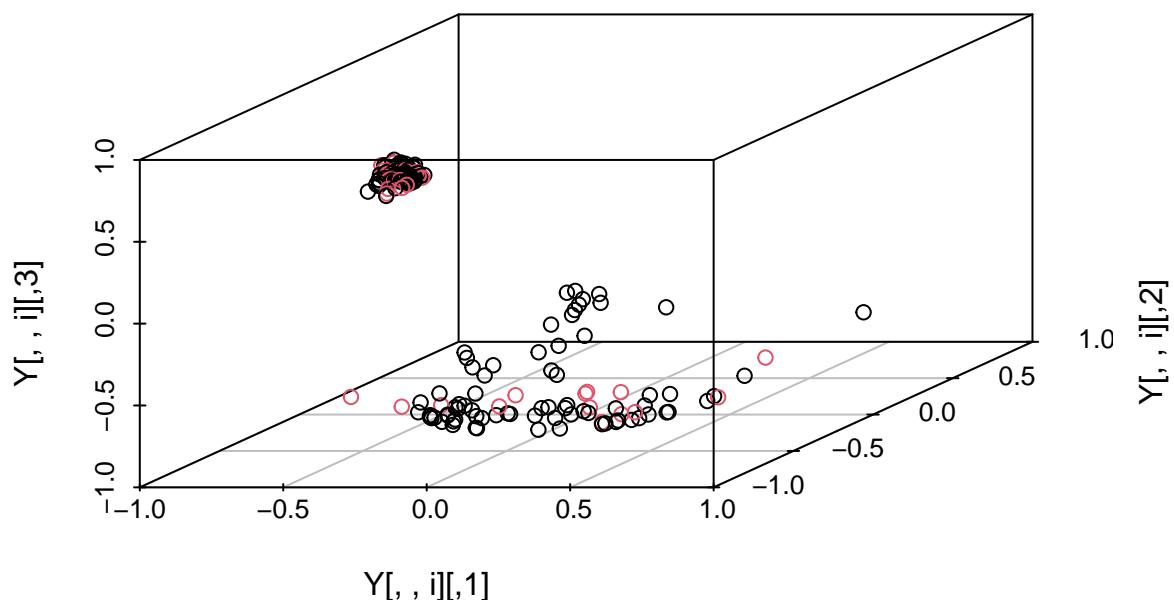
```
## [1] "Iteration 136"
## [1] "Iteration 137"
## [1] "Iteration 138"
## [1] "Iteration 139"
## [1] "Iteration 140"
## [1] "Iteration 140: objective function value is 2.505425"
```



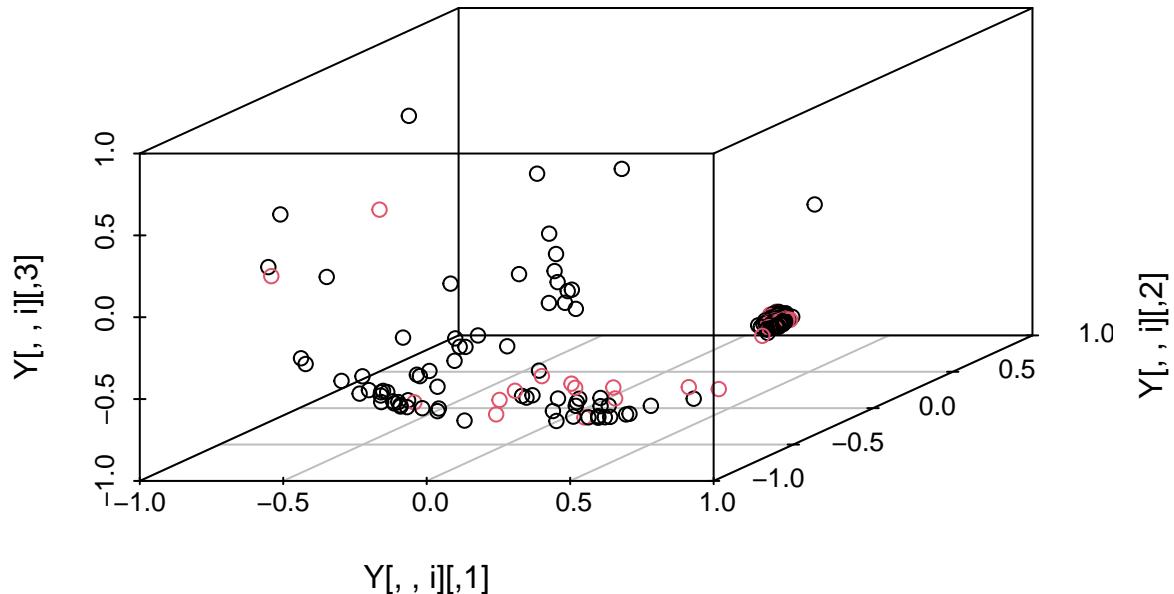
```
## [1] "Iteration 141"
## [1] "Iteration 142"
## [1] "Iteration 143"
## [1] "Iteration 144"
## [1] "Iteration 145"
## [1] "Iteration 145: objective function value is 2.050375"
```



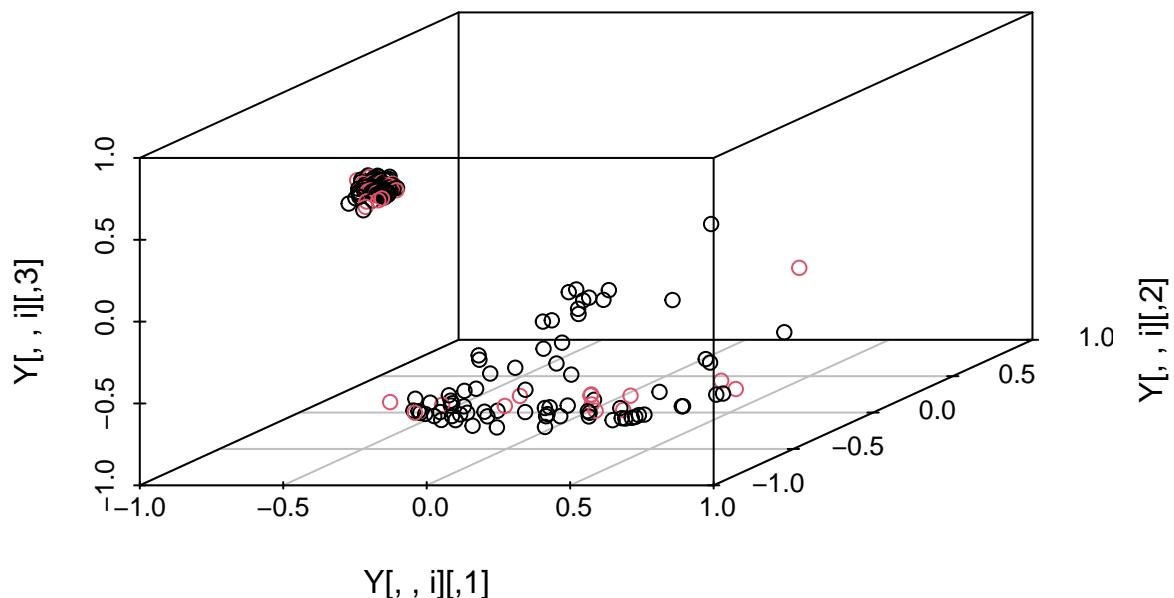
```
## [1] "Iteration 146"
## [1] "Iteration 147"
## [1] "Iteration 148"
## [1] "Iteration 149"
## [1] "Iteration 150"
## [1] "Iteration 150: objective function value is 2.472951"
```



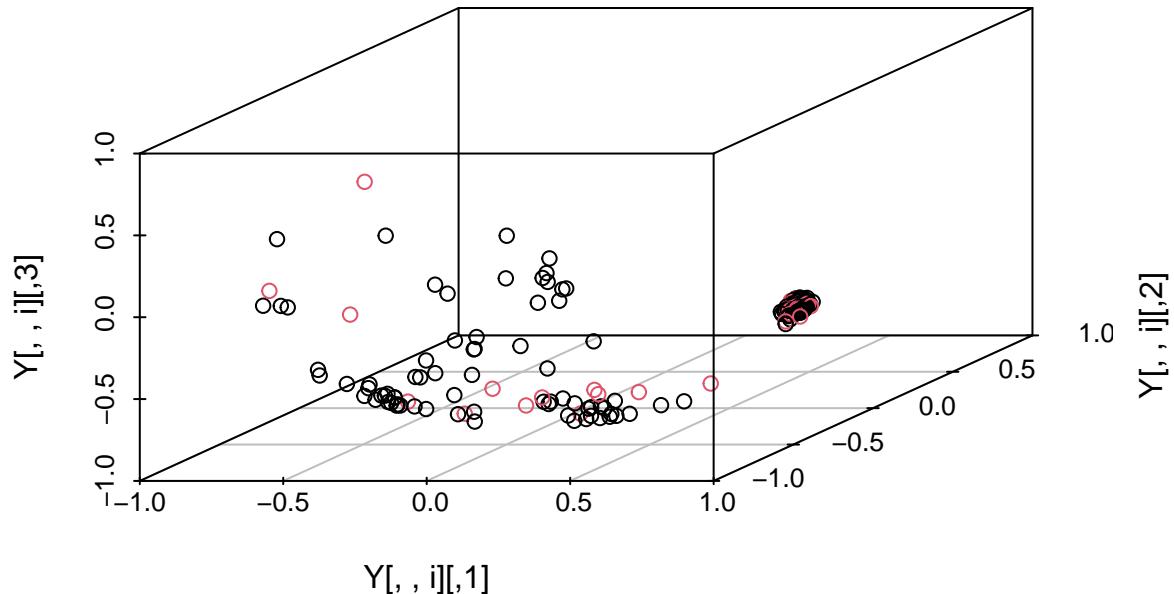
```
## [1] "Iteration 151"
## [1] "Iteration 152"
## [1] "Iteration 153"
## [1] "Iteration 154"
## [1] "Iteration 155"
## [1] "Iteration 155: objective function value is 2.120402"
```



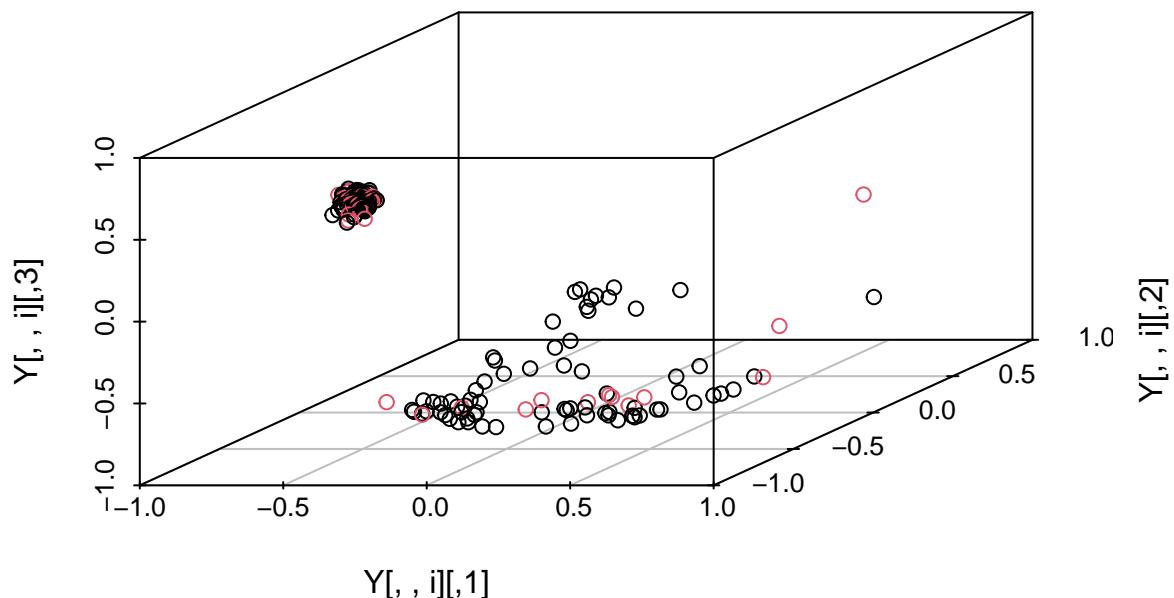
```
## [1] "Iteration 156"
## [1] "Iteration 157"
## [1] "Iteration 158"
## [1] "Iteration 159"
## [1] "Iteration 160"
## [1] "Iteration 160: objective function value is 2.468631"
```



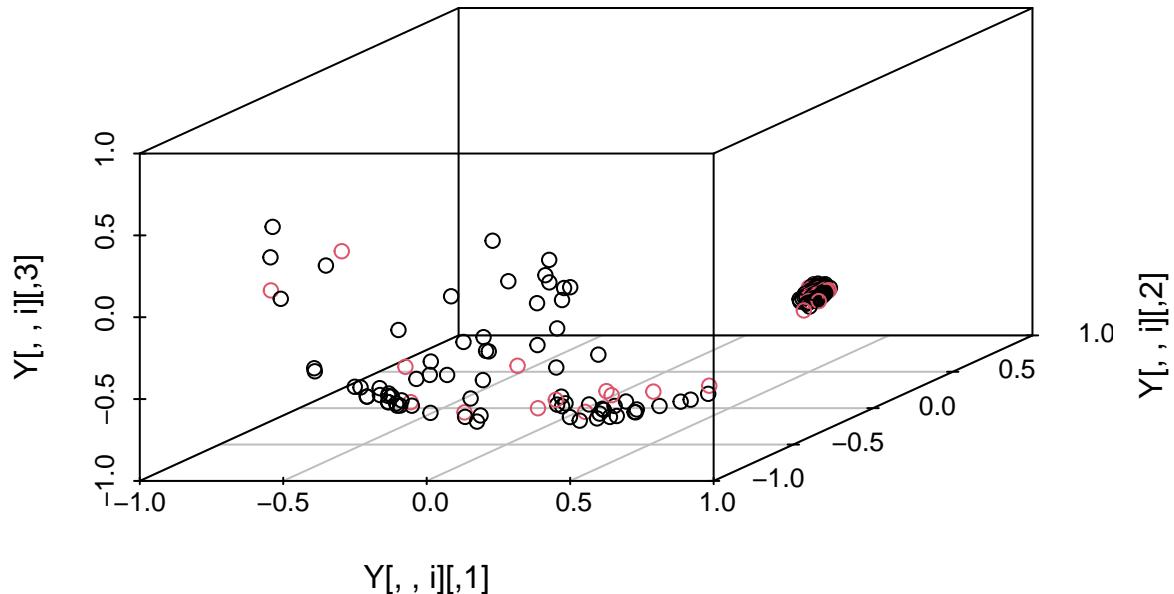
```
## [1] "Iteration 161"
## [1] "Iteration 162"
## [1] "Iteration 163"
## [1] "Iteration 164"
## [1] "Iteration 165"
## [1] "Iteration 165: objective function value is 2.145813"
```



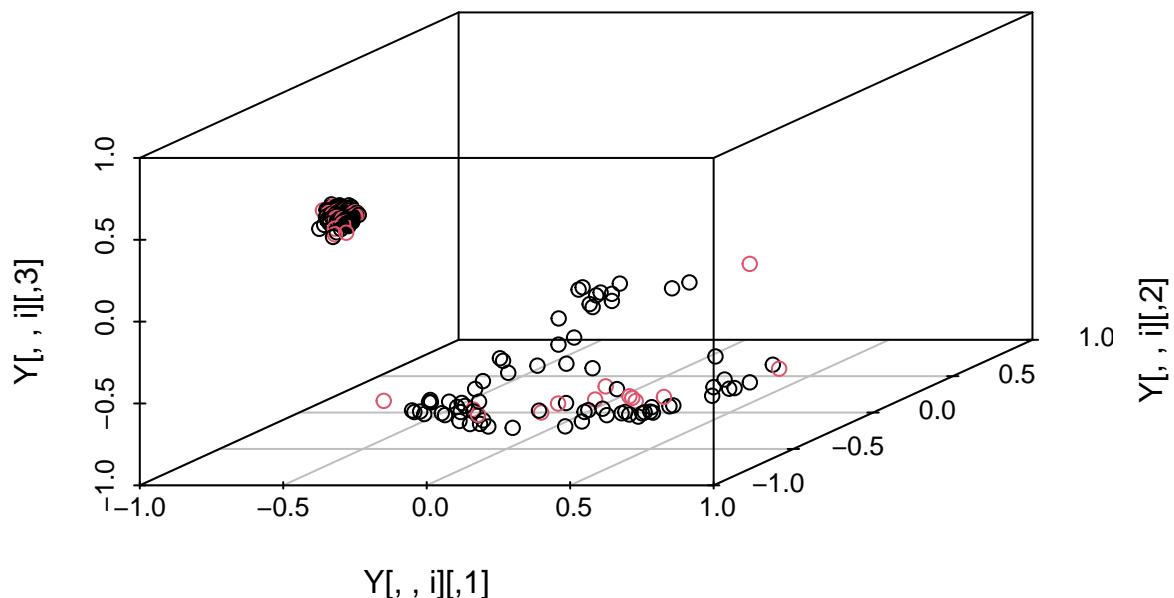
```
## [1] "Iteration 166"
## [1] "Iteration 167"
## [1] "Iteration 168"
## [1] "Iteration 169"
## [1] "Iteration 170"
## [1] "Iteration 170: objective function value is 2.468940"
```



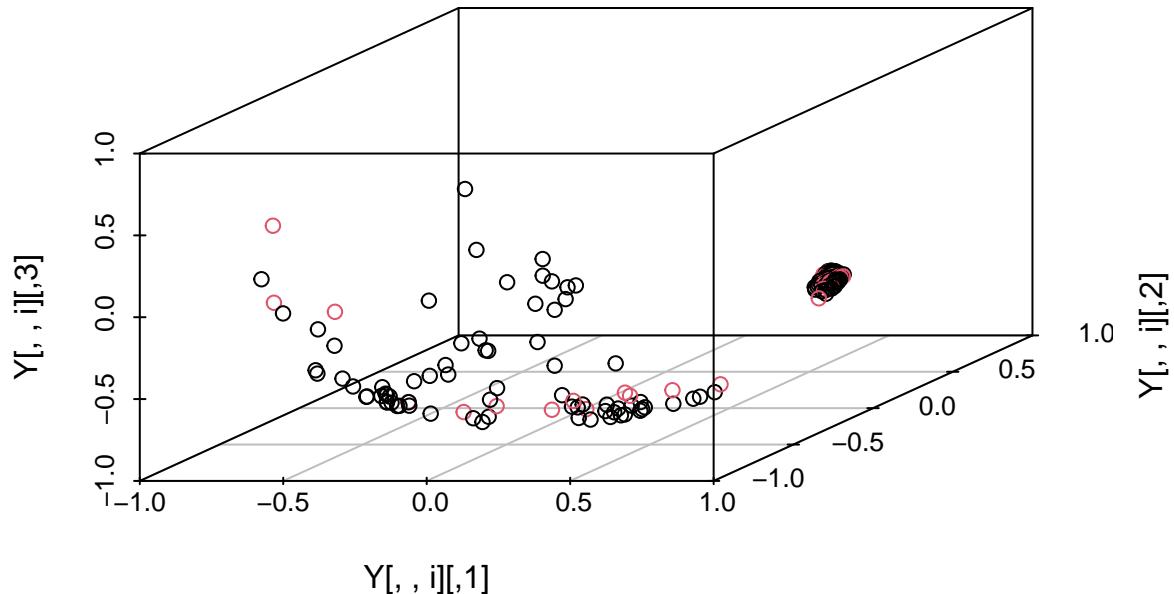
```
## [1] "Iteration 171"
## [1] "Iteration 172"
## [1] "Iteration 173"
## [1] "Iteration 174"
## [1] "Iteration 175"
## [1] "Iteration 175: objective function value is 2.150351"
```



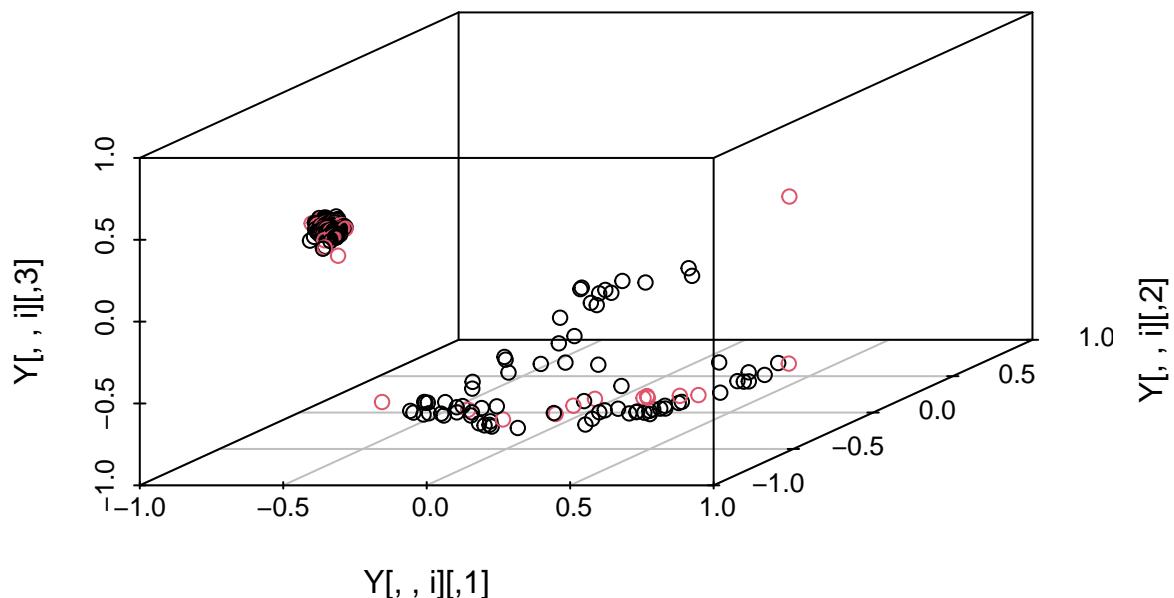
```
## [1] "Iteration 176"
## [1] "Iteration 177"
## [1] "Iteration 178"
## [1] "Iteration 179"
## [1] "Iteration 180"
## [1] "Iteration 180: objective function value is 2.447549"
```



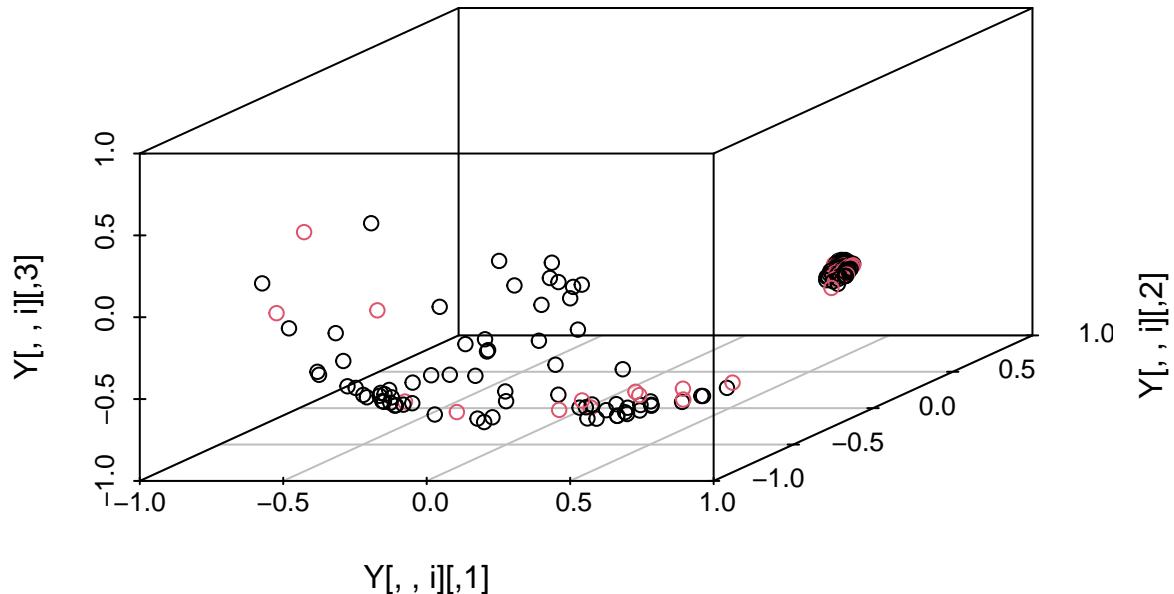
```
## [1] "Iteration 181"
## [1] "Iteration 182"
## [1] "Iteration 183"
## [1] "Iteration 184"
## [1] "Iteration 185"
## [1] "Iteration 185: objective function value is 2.178391"
```



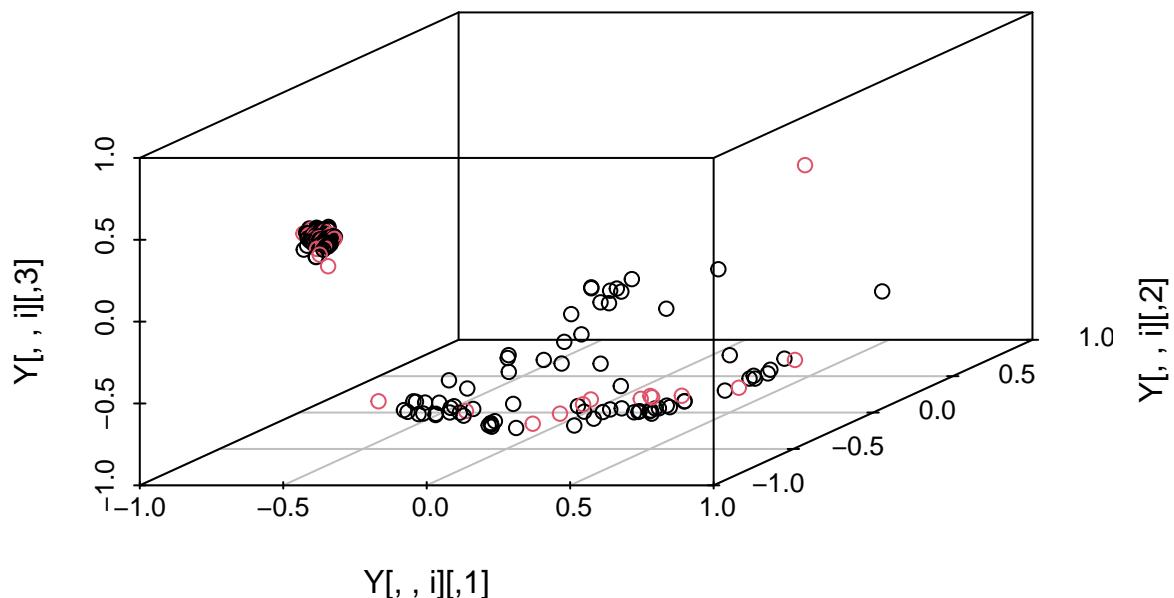
```
## [1] "Iteration 186"
## [1] "Iteration 187"
## [1] "Iteration 188"
## [1] "Iteration 189"
## [1] "Iteration 190"
## [1] "Iteration 190: objective function value is 2.423388"
```



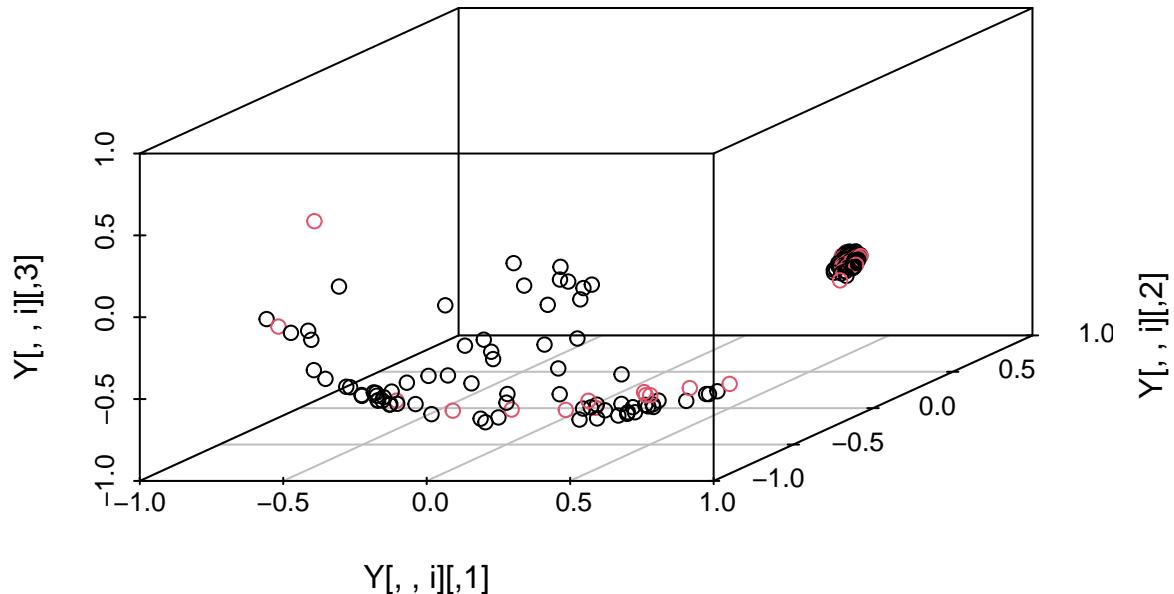
```
## [1] "Iteration 191"
## [1] "Iteration 192"
## [1] "Iteration 193"
## [1] "Iteration 194"
## [1] "Iteration 195"
## [1] "Iteration 195: objective function value is 2.188162"
```



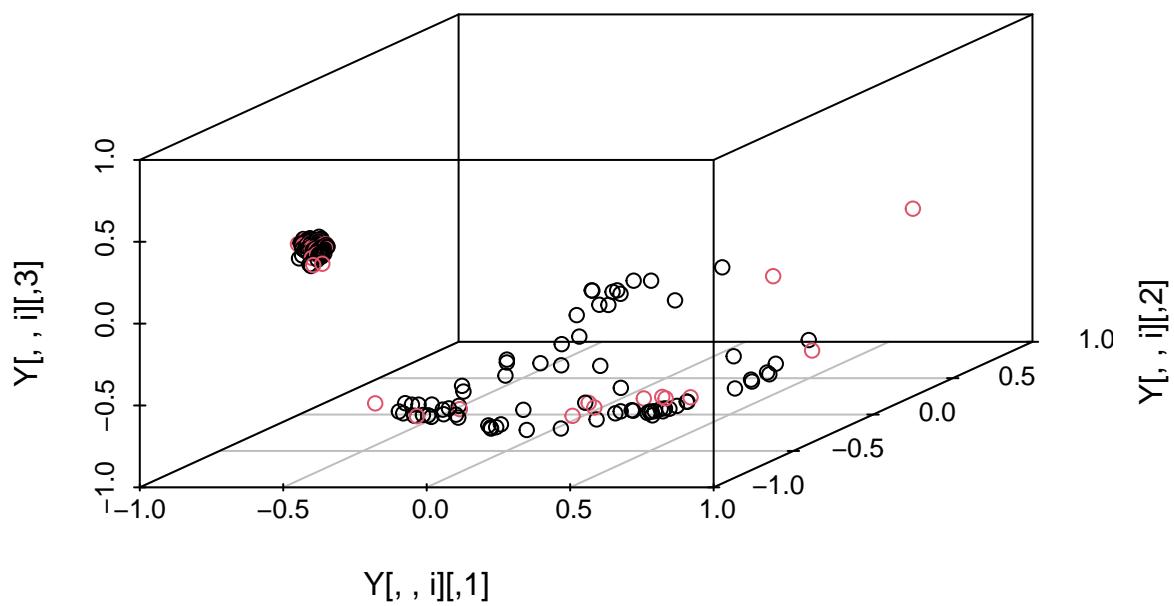
```
## [1] "Iteration 196"
## [1] "Iteration 197"
## [1] "Iteration 198"
## [1] "Iteration 199"
## [1] "Iteration 200"
## [1] "Iteration 200: objective function value is 2.406584"
```



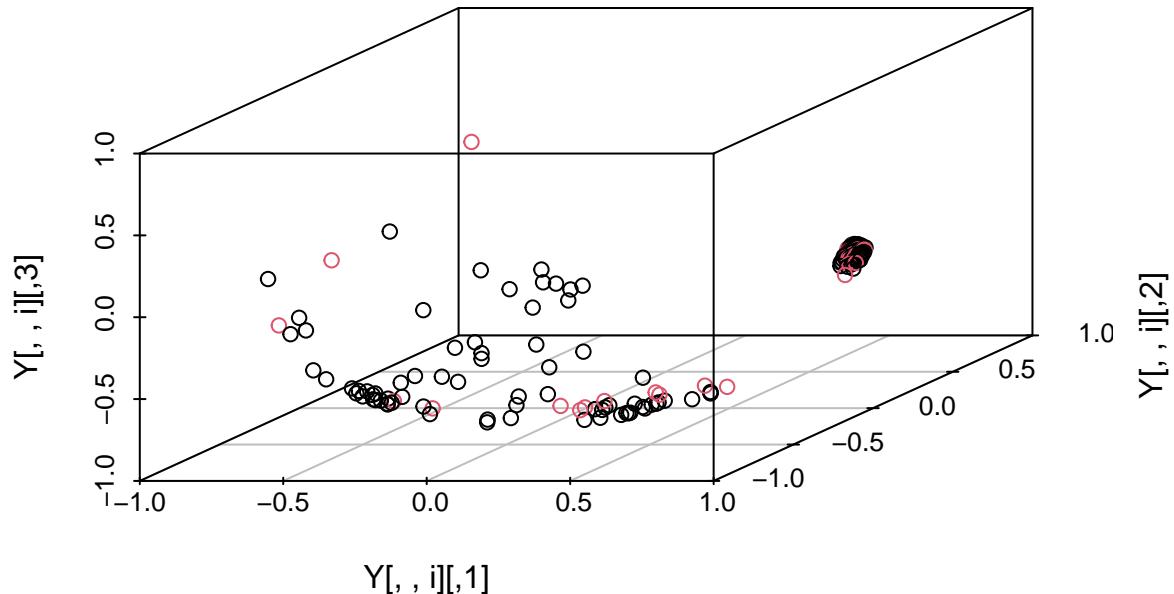
```
## [1] "Iteration 201"
## [1] "Iteration 202"
## [1] "Iteration 203"
## [1] "Iteration 204"
## [1] "Iteration 205"
## [1] "Iteration 205: objective function value is 2.195274"
```



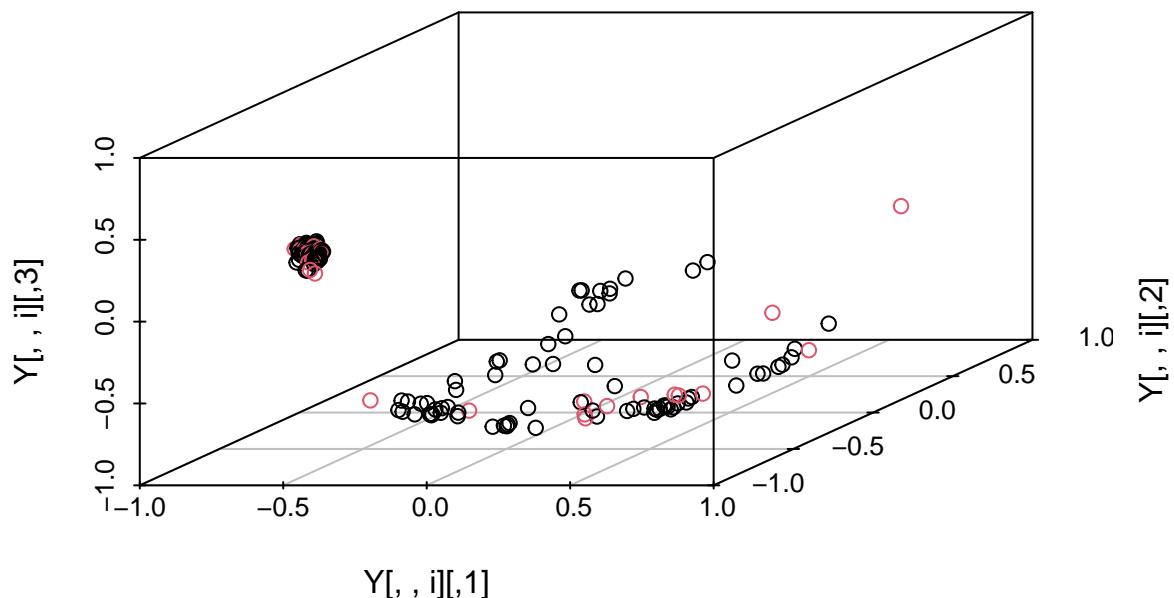
```
## [1] "Iteration 206"
## [1] "Iteration 207"
## [1] "Iteration 208"
## [1] "Iteration 209"
## [1] "Iteration 210"
## [1] "Iteration 210: objective function value is 2.392580"
```



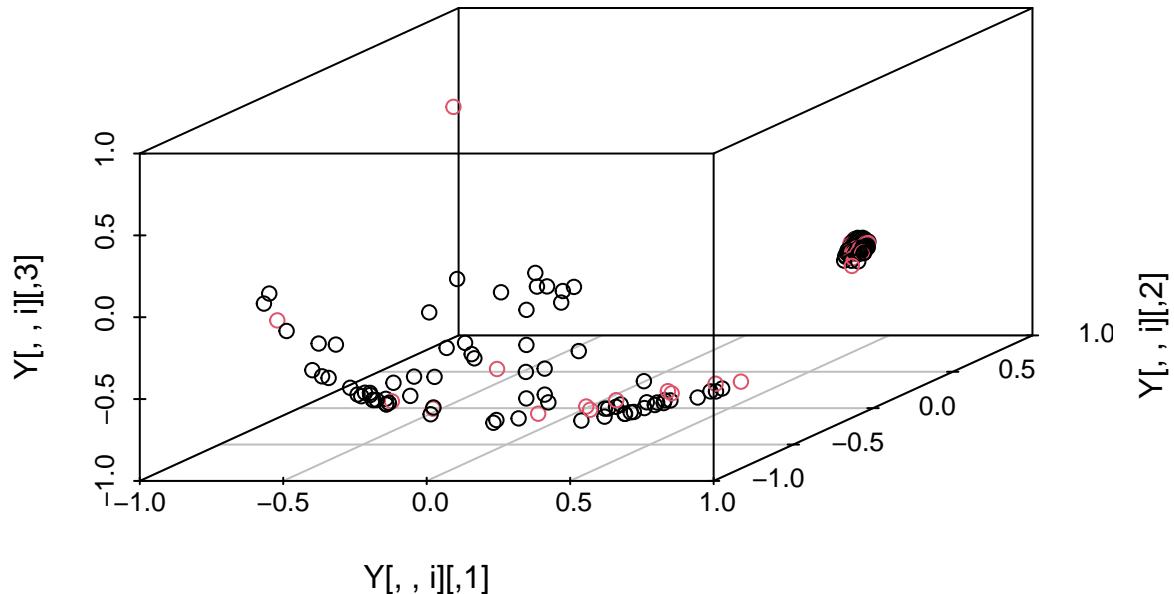
```
## [1] "Iteration 211"
## [1] "Iteration 212"
## [1] "Iteration 213"
## [1] "Iteration 214"
## [1] "Iteration 215"
## [1] "Iteration 215: objective function value is 2.243876"
```



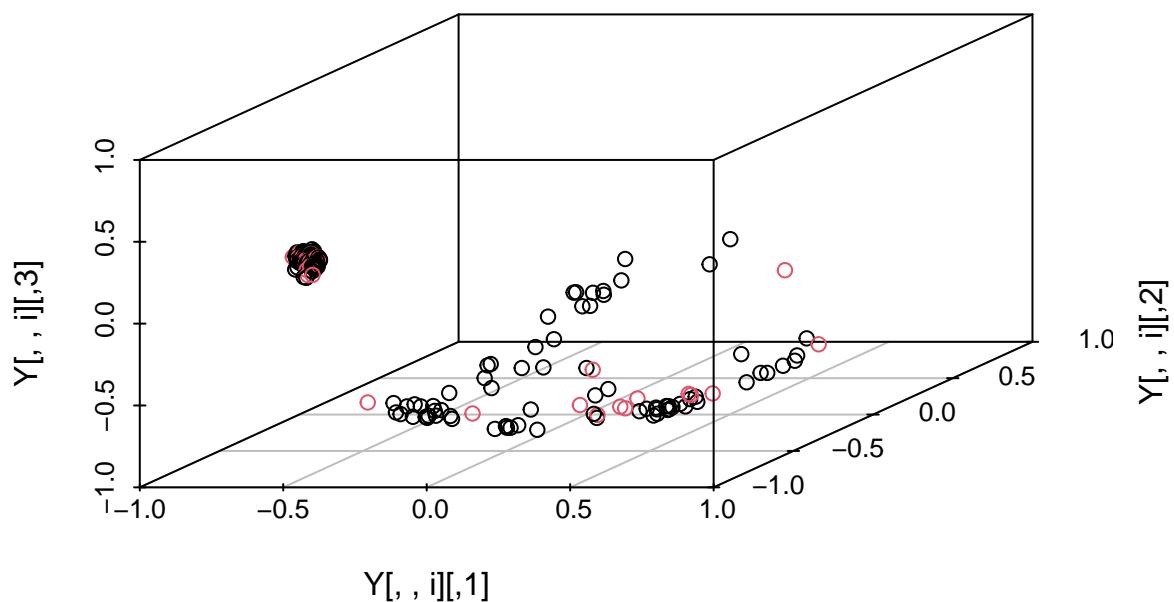
```
## [1] "Iteration 216"
## [1] "Iteration 217"
## [1] "Iteration 218"
## [1] "Iteration 219"
## [1] "Iteration 220"
## [1] "Iteration 220: objective function value is 2.384353"
```



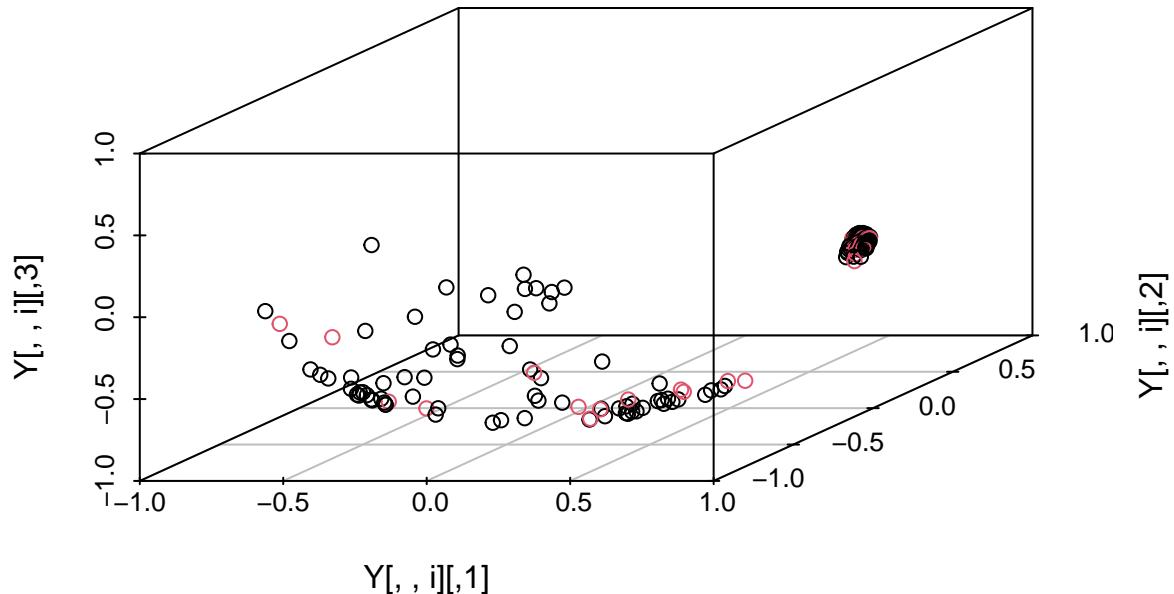
```
## [1] "Iteration 221"
## [1] "Iteration 222"
## [1] "Iteration 223"
## [1] "Iteration 224"
## [1] "Iteration 225"
## [1] "Iteration 225: objective function value is 2.246389"
```



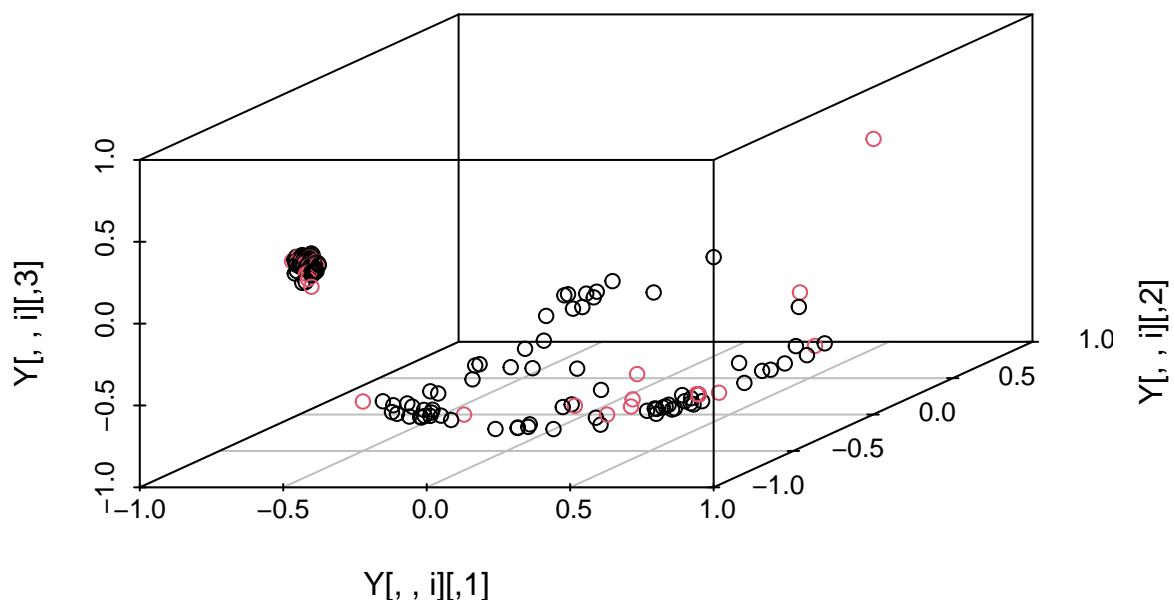
```
## [1] "Iteration 226"
## [1] "Iteration 227"
## [1] "Iteration 228"
## [1] "Iteration 229"
## [1] "Iteration 230"
## [1] "Iteration 230: objective function value is 2.369155"
```



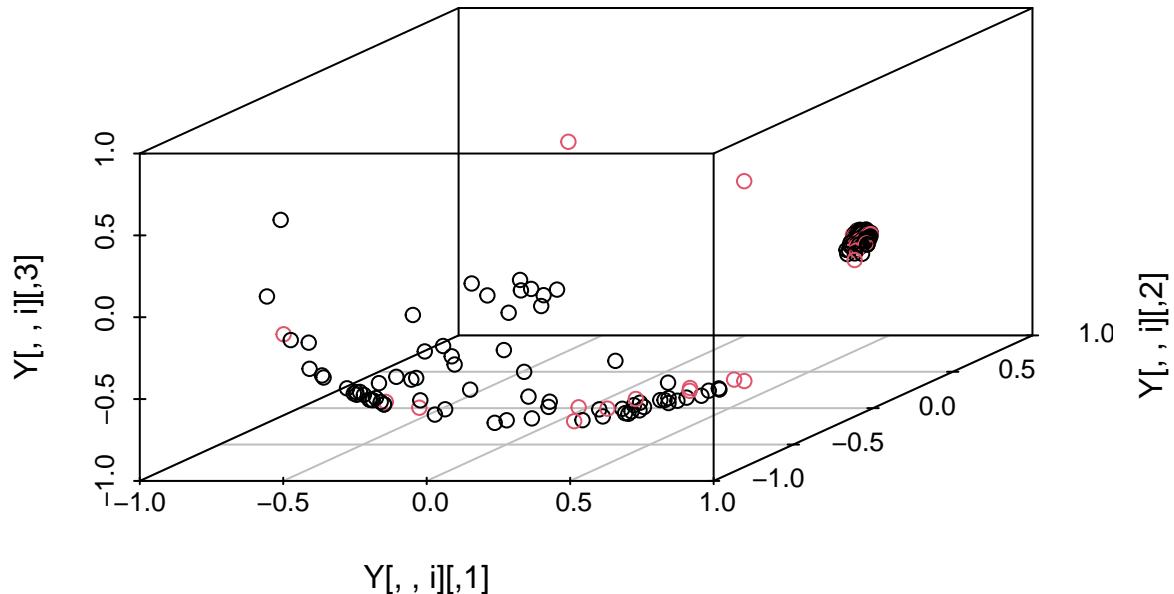
```
## [1] "Iteration 231"
## [1] "Iteration 232"
## [1] "Iteration 233"
## [1] "Iteration 234"
## [1] "Iteration 235"
## [1] "Iteration 235: objective function value is 2.247108"
```



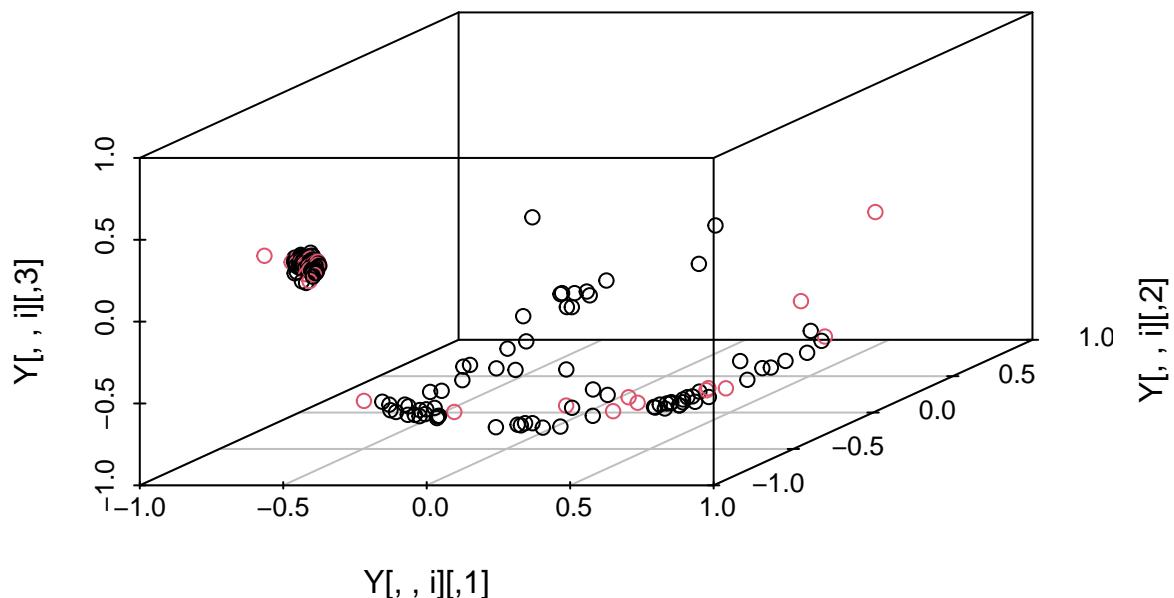
```
## [1] "Iteration 236"
## [1] "Iteration 237"
## [1] "Iteration 238"
## [1] "Iteration 239"
## [1] "Iteration 240"
## [1] "Iteration 240: objective function value is 2.352745"
```



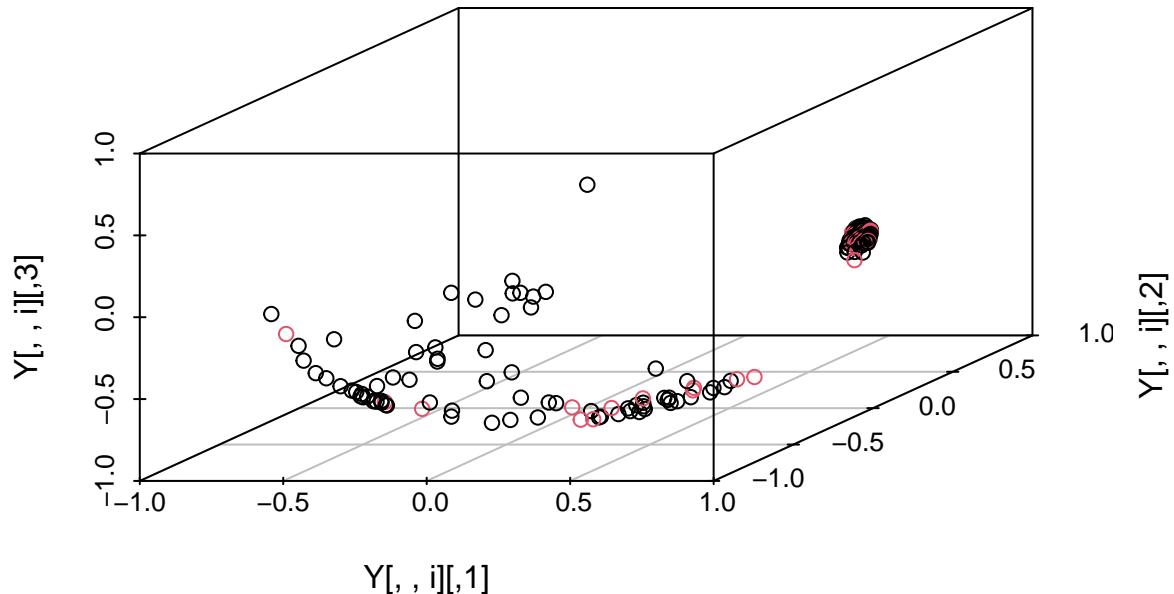
```
## [1] "Iteration 241"
## [1] "Iteration 242"
## [1] "Iteration 243"
## [1] "Iteration 244"
## [1] "Iteration 245"
## [1] "Iteration 245: objective function value is 2.266935"
```



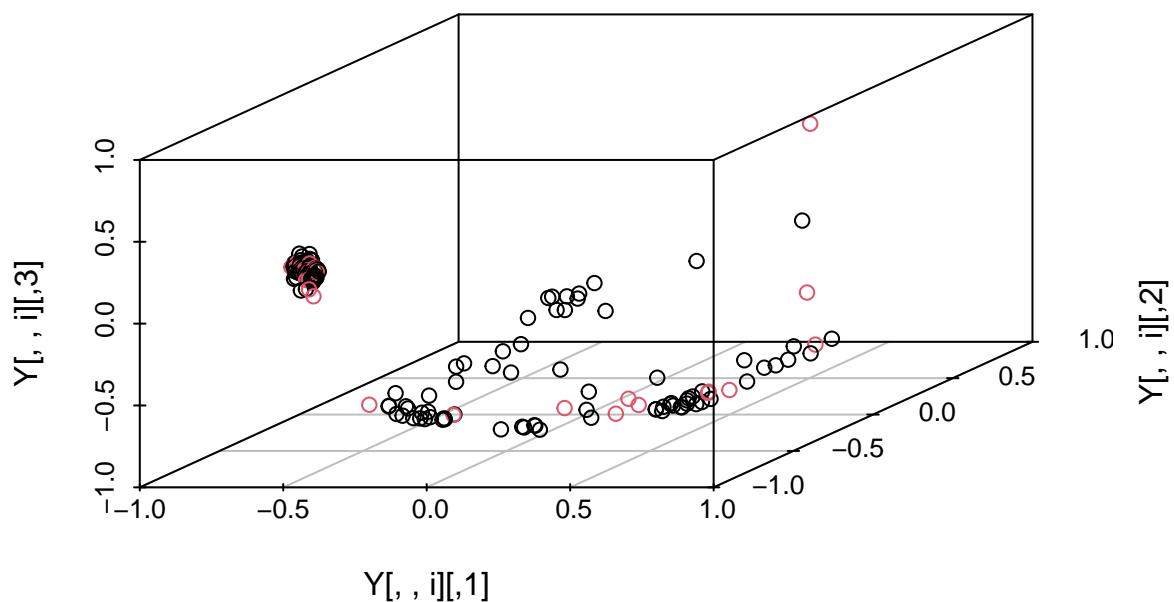
```
## [1] "Iteration 246"
## [1] "Iteration 247"
## [1] "Iteration 248"
## [1] "Iteration 249"
## [1] "Iteration 250"
## [1] "Iteration 250: objective function value is 2.333277"
```



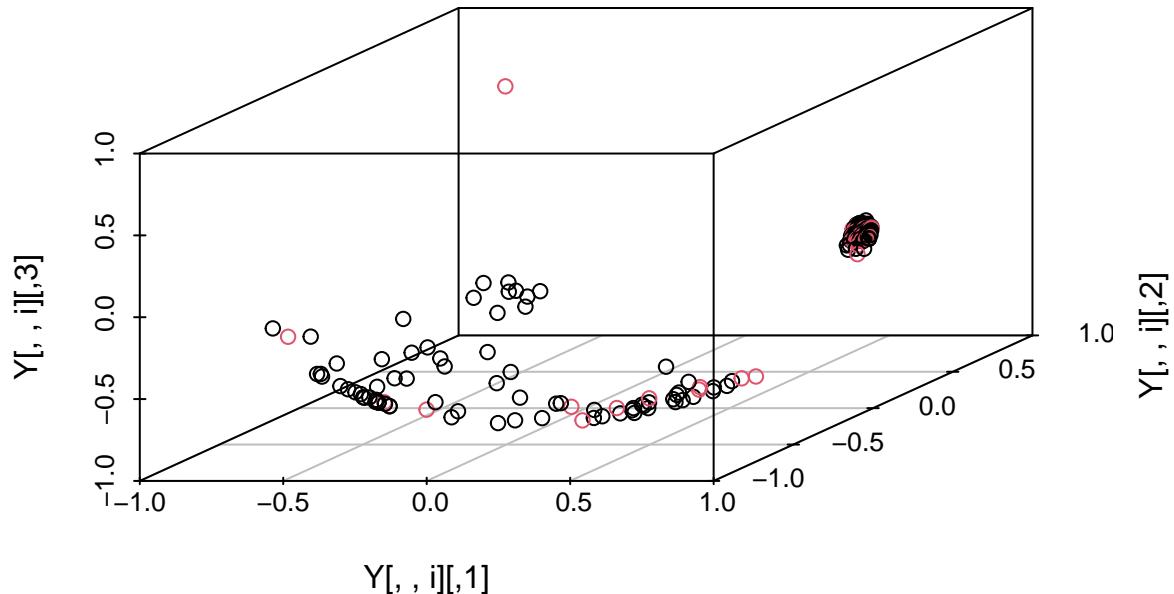
```
## [1] "Iteration 251"
## [1] "Iteration 252"
## [1] "Iteration 253"
## [1] "Iteration 254"
## [1] "Iteration 255"
## [1] "Iteration 255: objective function value is 2.233635"
```



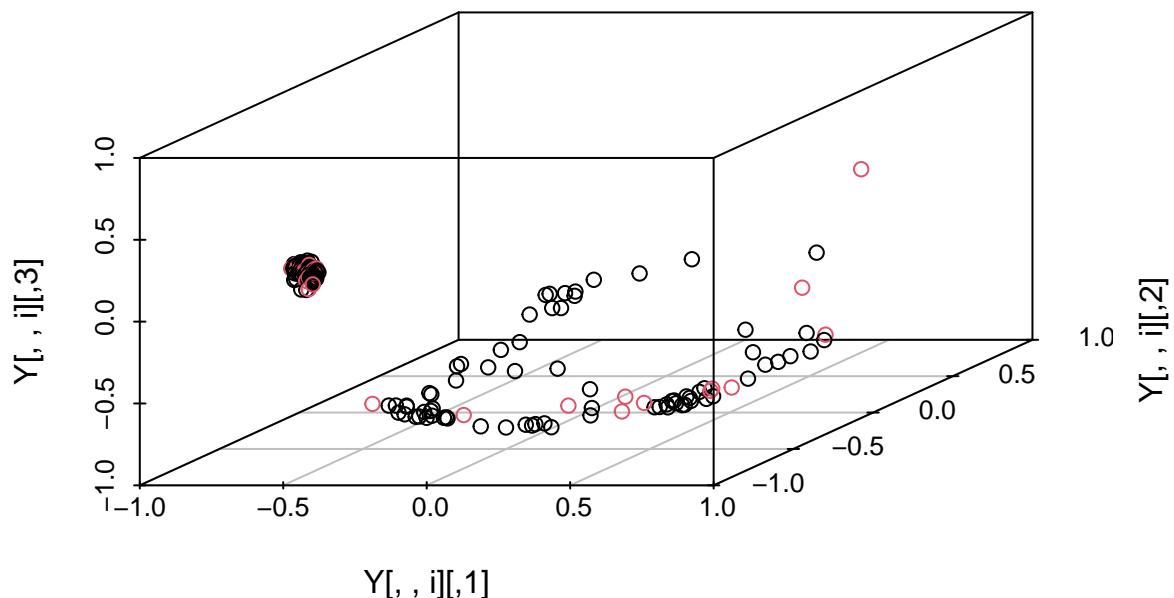
```
## [1] "Iteration 256"
## [1] "Iteration 257"
## [1] "Iteration 258"
## [1] "Iteration 259"
## [1] "Iteration 260"
## [1] "Iteration 260: objective function value is 2.332661"
```



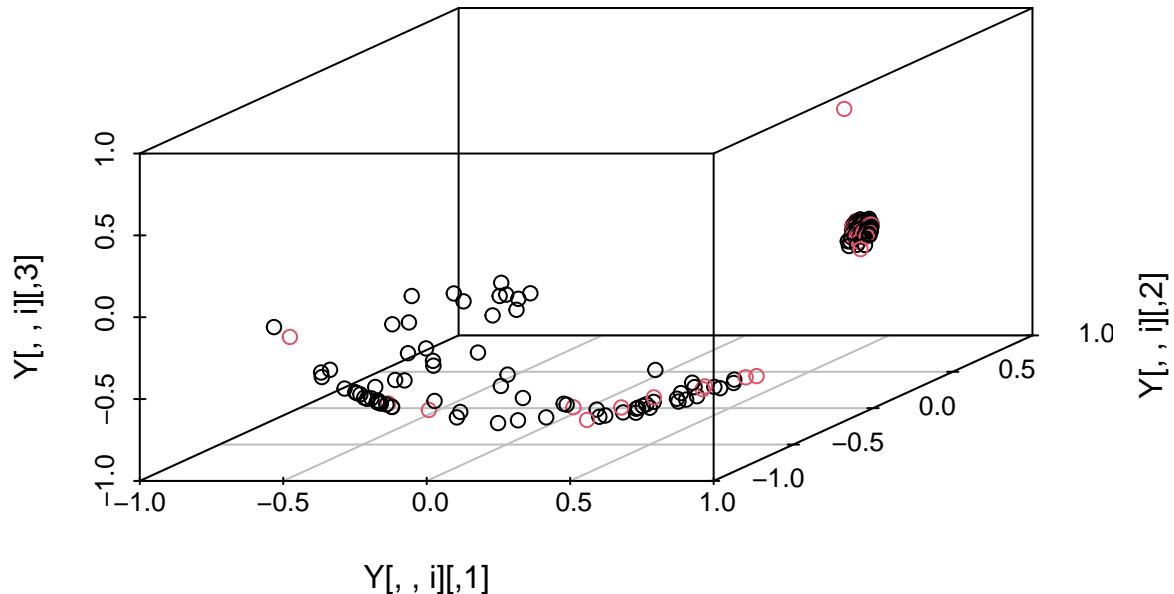
```
## [1] "Iteration 261"
## [1] "Iteration 262"
## [1] "Iteration 263"
## [1] "Iteration 264"
## [1] "Iteration 265"
## [1] "Iteration 265: objective function value is 2.253570"
```



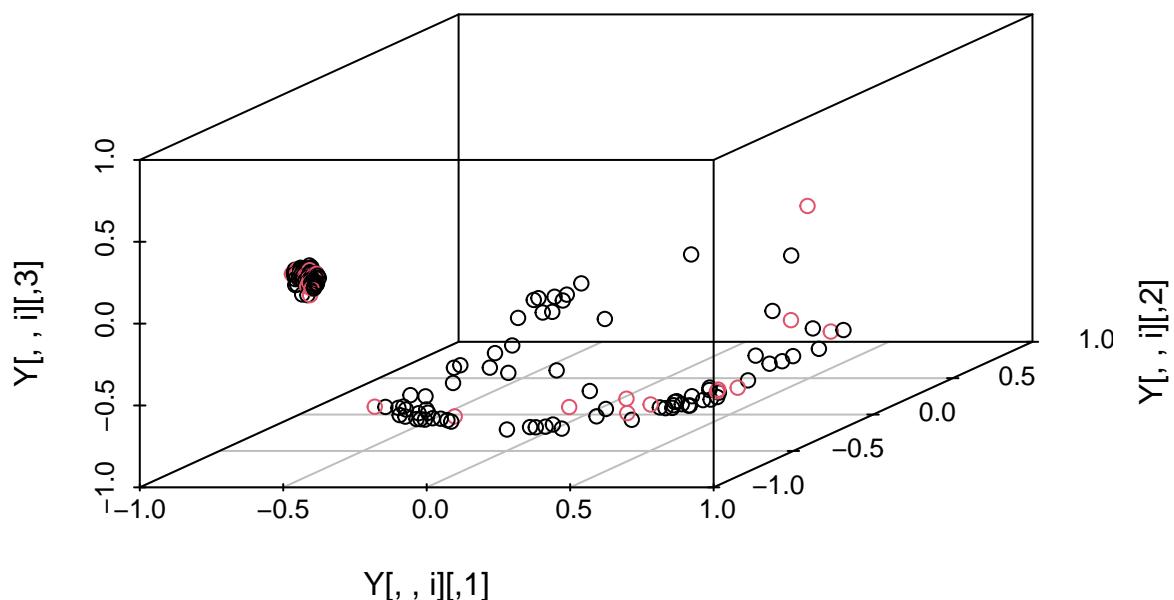
```
## [1] "Iteration 266"
## [1] "Iteration 267"
## [1] "Iteration 268"
## [1] "Iteration 269"
## [1] "Iteration 270"
## [1] "Iteration 270: objective function value is 2.334207"
```



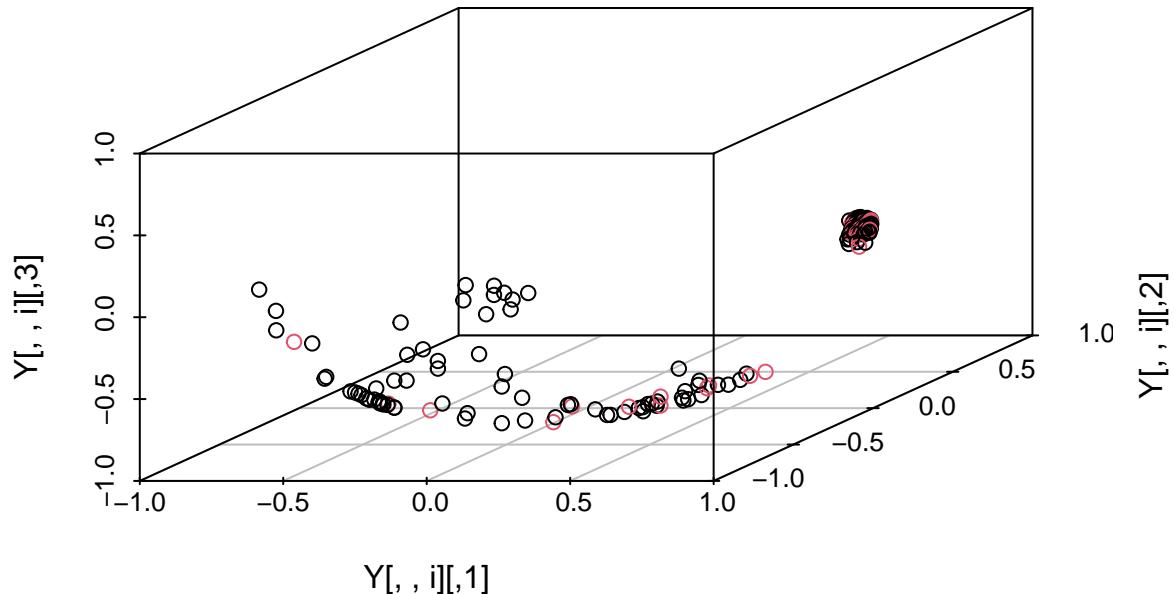
```
## [1] "Iteration 271"
## [1] "Iteration 272"
## [1] "Iteration 273"
## [1] "Iteration 274"
## [1] "Iteration 275"
## [1] "Iteration 275: objective function value is 2.250795"
```



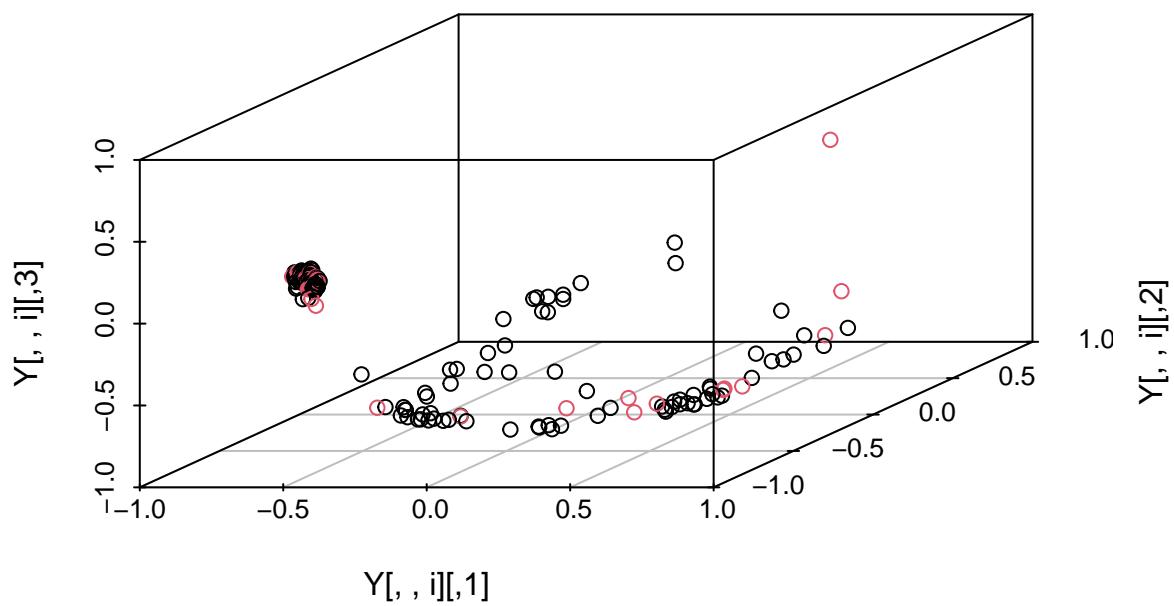
```
## [1] "Iteration 276"
## [1] "Iteration 277"
## [1] "Iteration 278"
## [1] "Iteration 279"
## [1] "Iteration 280"
## [1] "Iteration 280: objective function value is 2.327751"
```



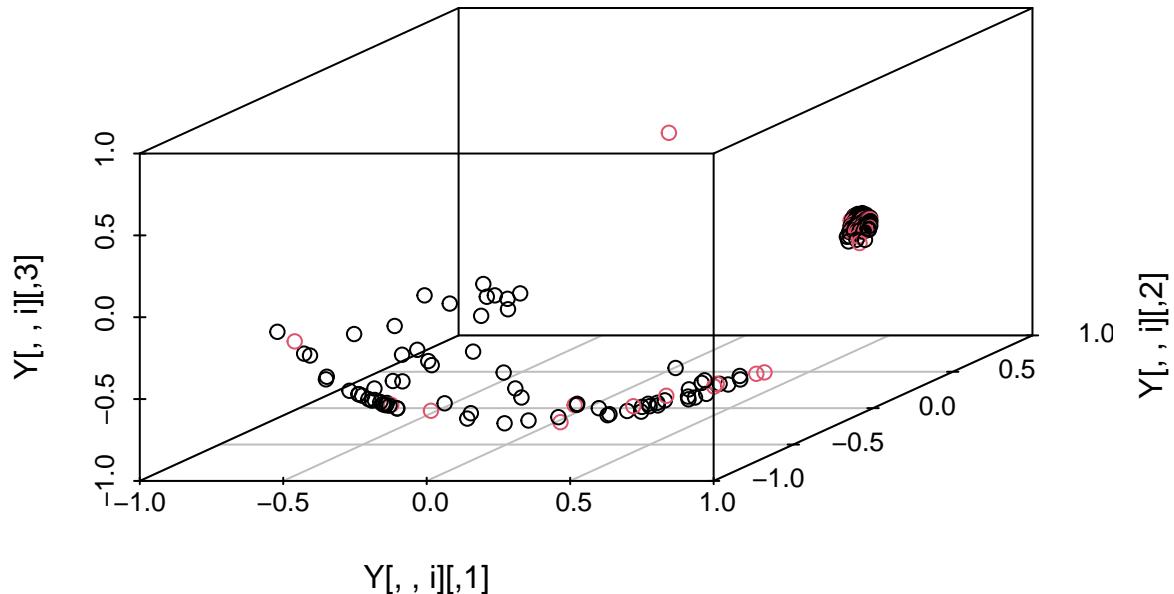
```
## [1] "Iteration 281"
## [1] "Iteration 282"
## [1] "Iteration 283"
## [1] "Iteration 284"
## [1] "Iteration 285"
## [1] "Iteration 285: objective function value is 2.257010"
```



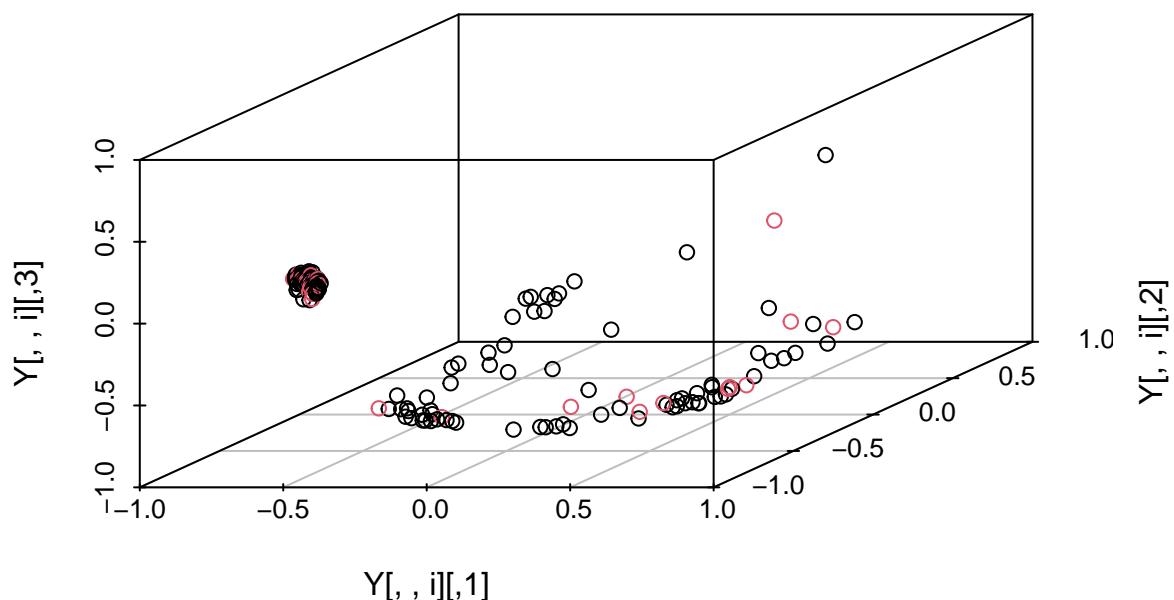
```
## [1] "Iteration 286"
## [1] "Iteration 287"
## [1] "Iteration 288"
## [1] "Iteration 289"
## [1] "Iteration 290"
## [1] "Iteration 290: objective function value is 2.317556"
```



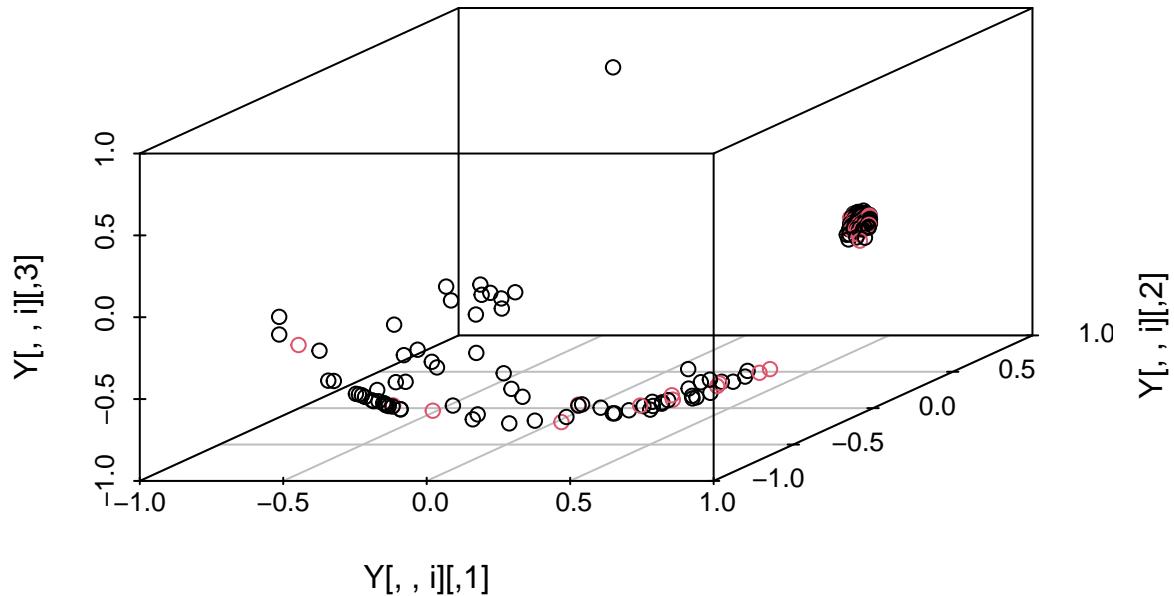
```
## [1] "Iteration 291"
## [1] "Iteration 292"
## [1] "Iteration 293"
## [1] "Iteration 294"
## [1] "Iteration 295"
## [1] "Iteration 295: objective function value is 2.260123"
```



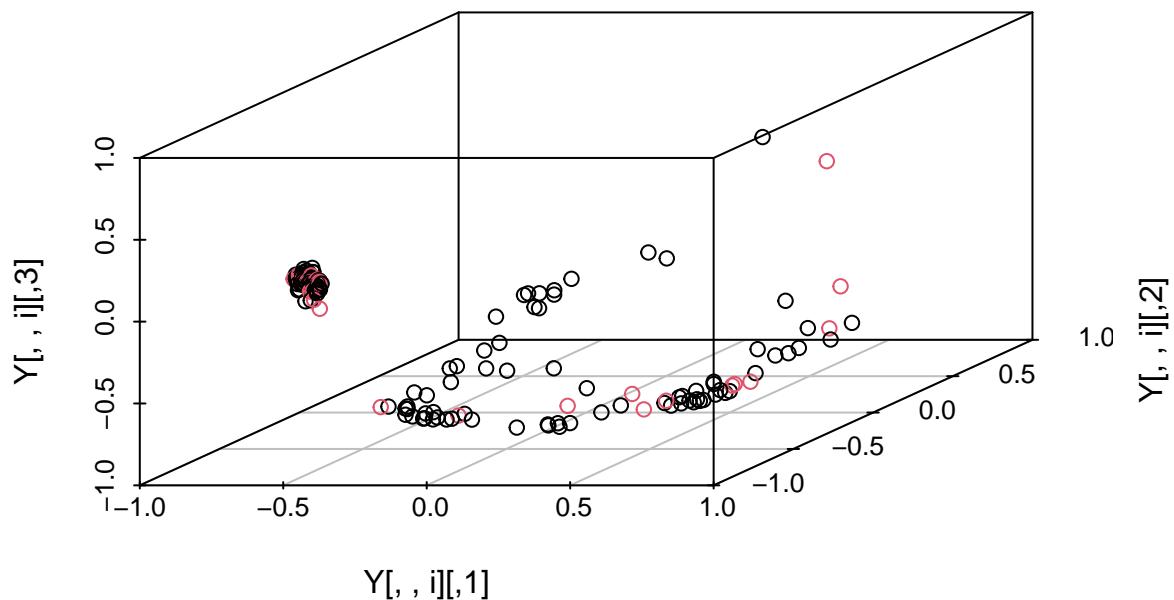
```
## [1] "Iteration 296"
## [1] "Iteration 297"
## [1] "Iteration 298"
## [1] "Iteration 299"
## [1] "Iteration 300"
## [1] "Iteration 300: objective function value is 2.321157"
```



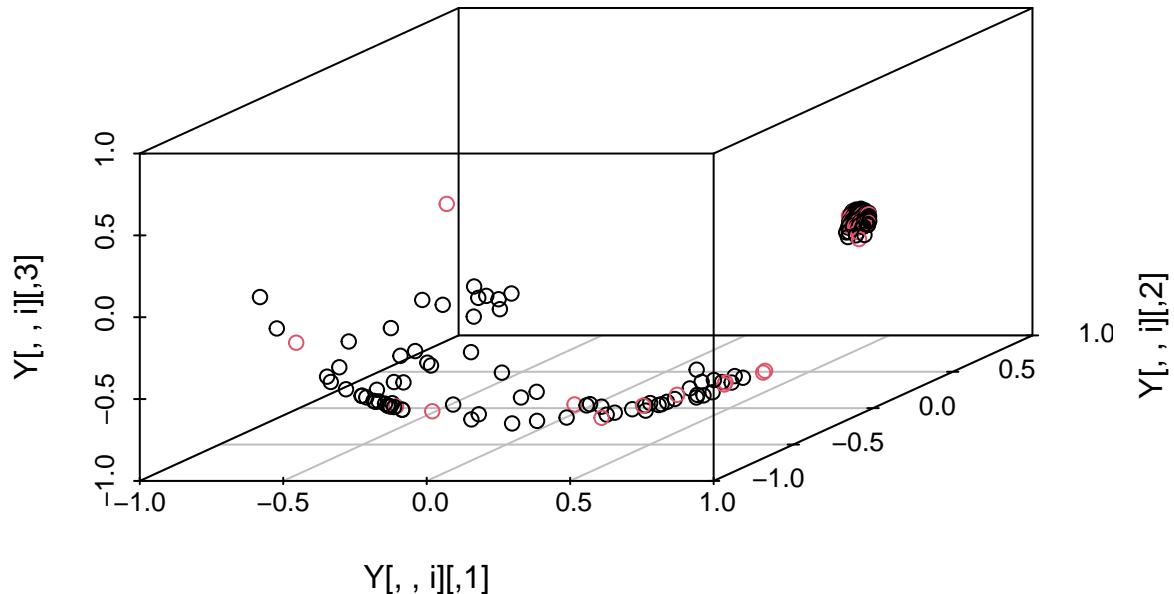
```
## [1] "Iteration 301"
## [1] "Iteration 302"
## [1] "Iteration 303"
## [1] "Iteration 304"
## [1] "Iteration 305"
## [1] "Iteration 305: objective function value is 2.255706"
```



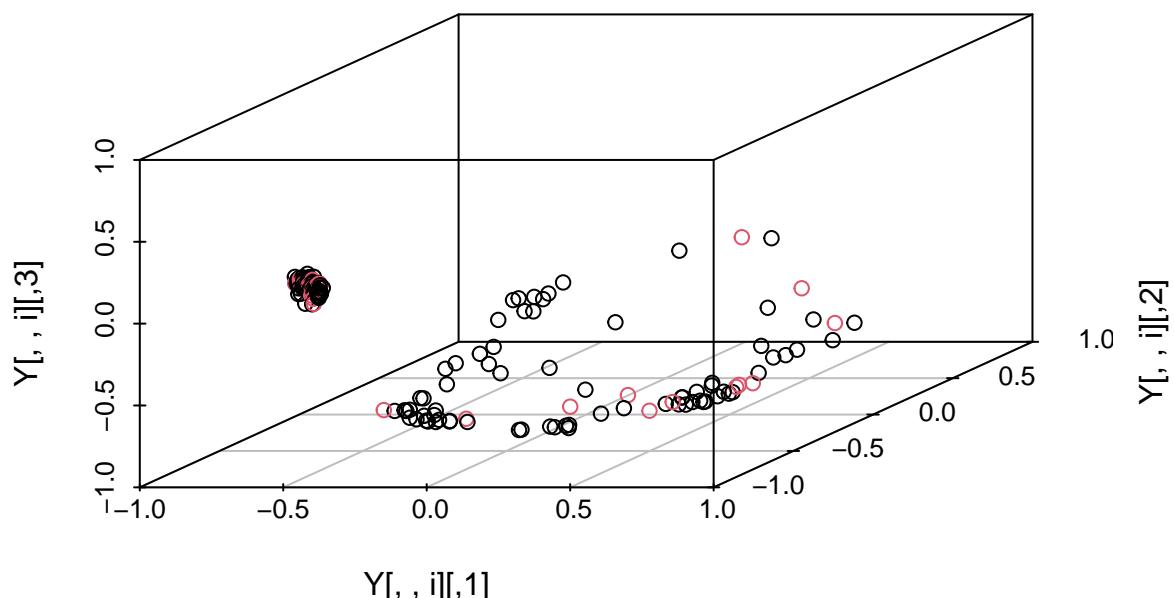
```
## [1] "Iteration 306"
## [1] "Iteration 307"
## [1] "Iteration 308"
## [1] "Iteration 309"
## [1] "Iteration 310"
## [1] "Iteration 310: objective function value is 2.322675"
```



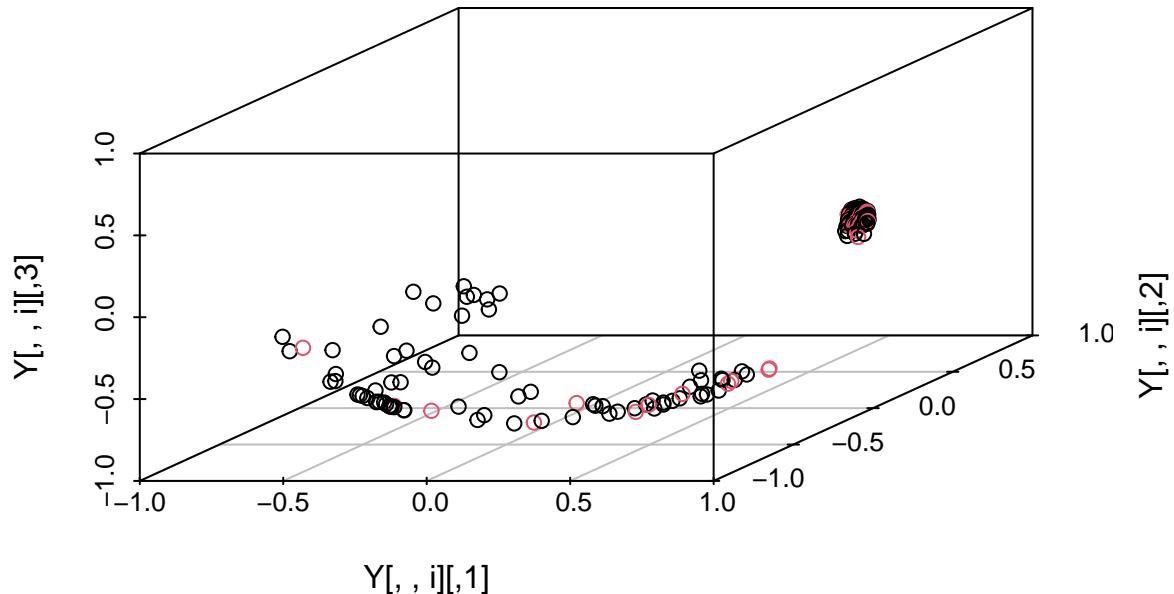
```
## [1] "Iteration 311"
## [1] "Iteration 312"
## [1] "Iteration 313"
## [1] "Iteration 314"
## [1] "Iteration 315"
## [1] "Iteration 315: objective function value is 2.267026"
```



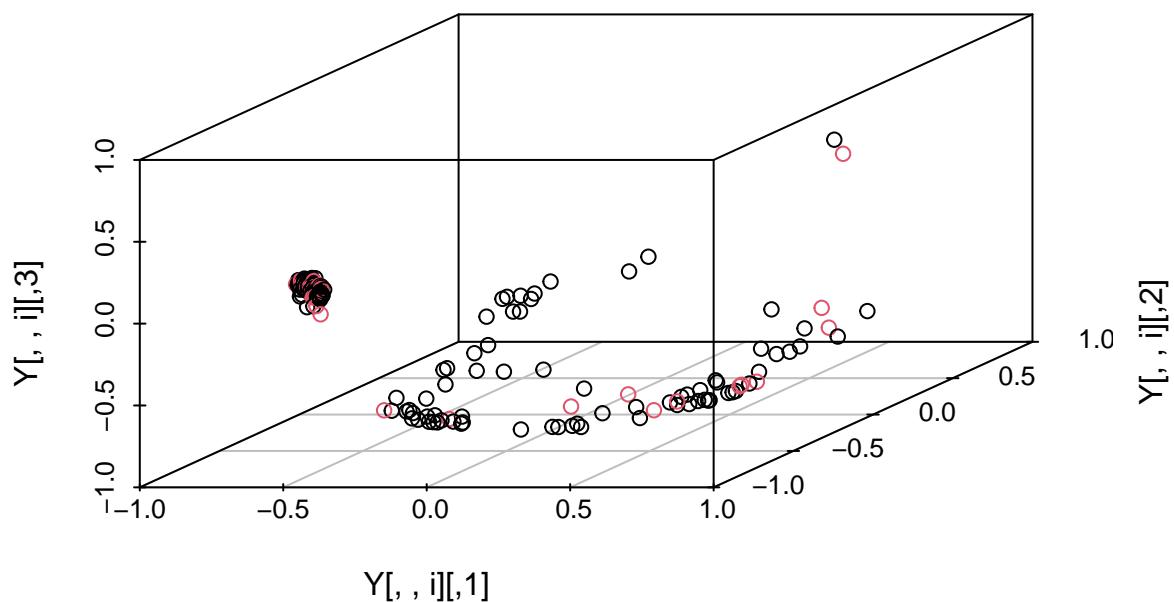
```
## [1] "Iteration 316"
## [1] "Iteration 317"
## [1] "Iteration 318"
## [1] "Iteration 319"
## [1] "Iteration 320"
## [1] "Iteration 320: objective function value is 2.313847"
```



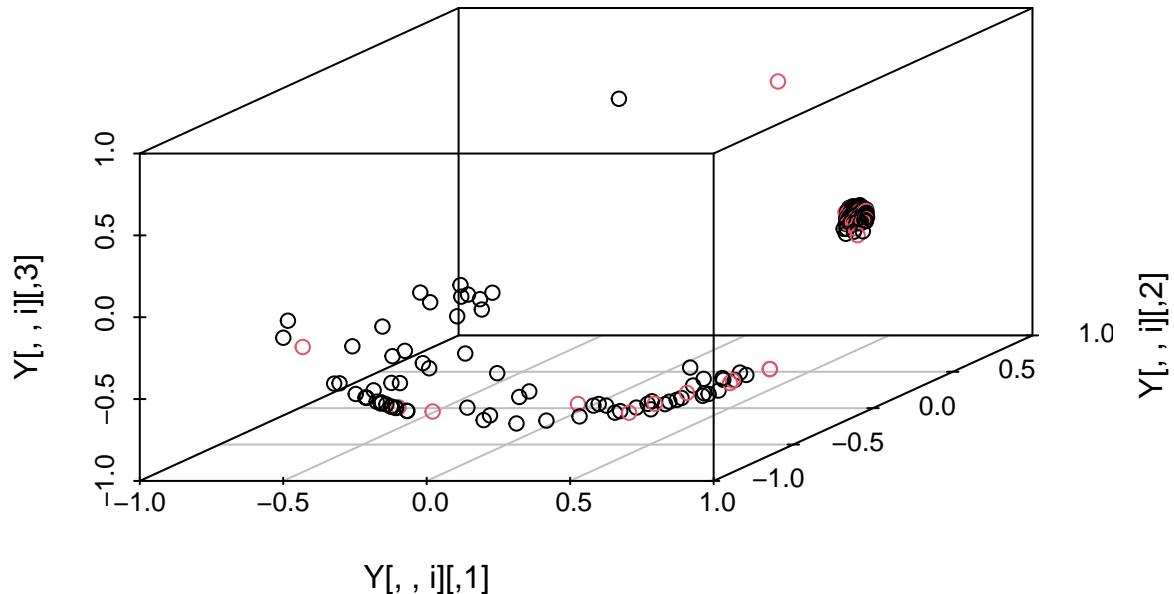
```
## [1] "Iteration 321"
## [1] "Iteration 322"
## [1] "Iteration 323"
## [1] "Iteration 324"
## [1] "Iteration 325"
## [1] "Iteration 325: objective function value is 2.266399"
```



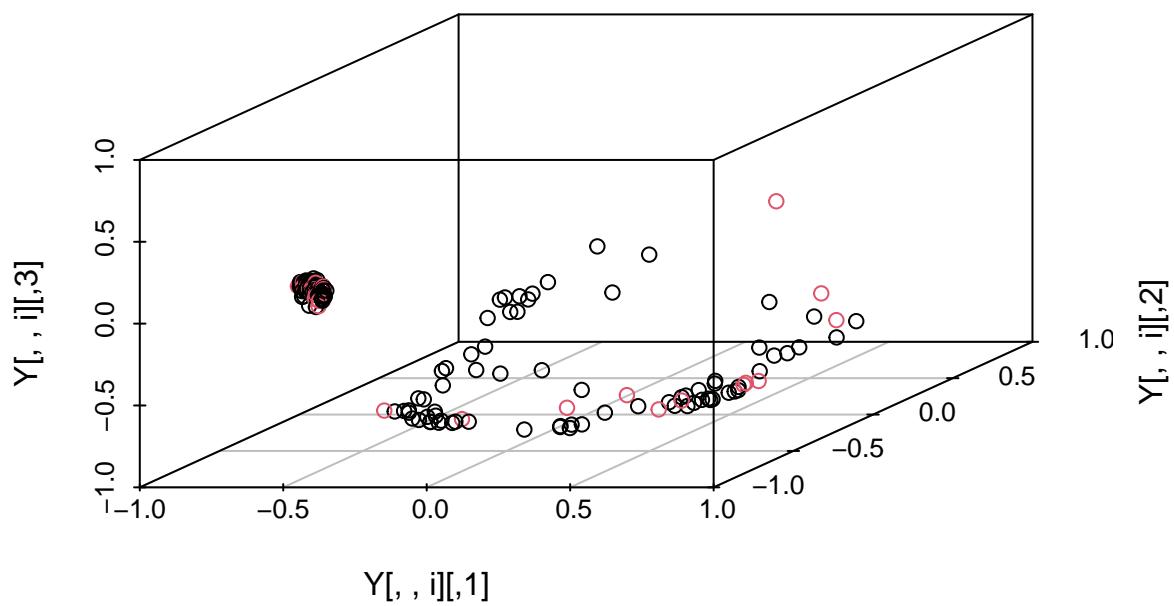
```
## [1] "Iteration 326"
## [1] "Iteration 327"
## [1] "Iteration 328"
## [1] "Iteration 329"
## [1] "Iteration 330"
## [1] "Iteration 330: objective function value is 2.314048"
```



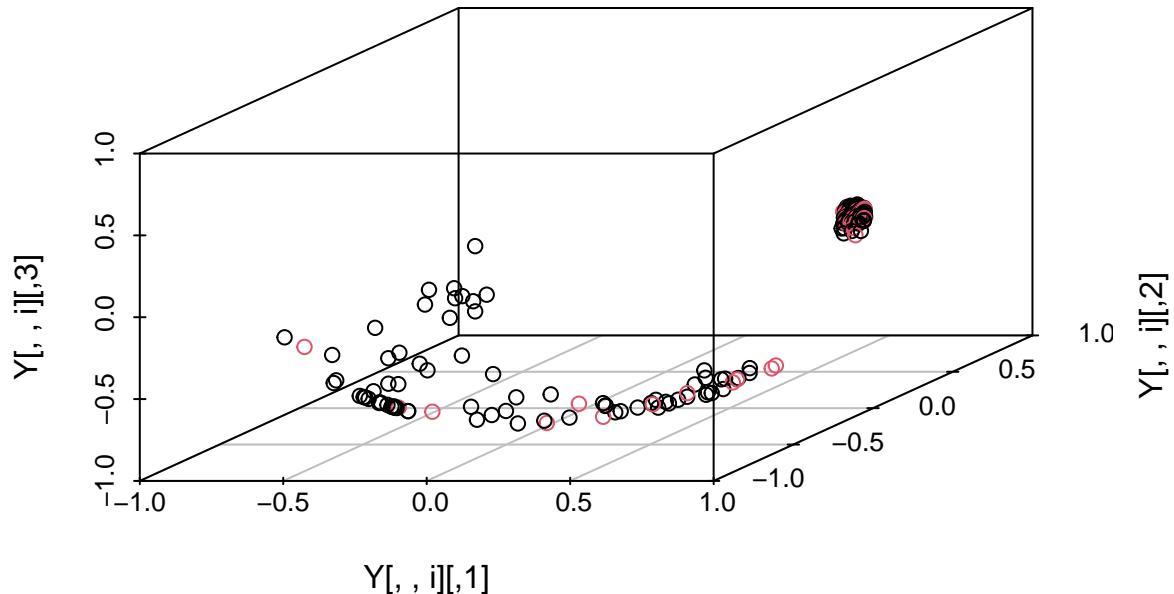
```
## [1] "Iteration 331"
## [1] "Iteration 332"
## [1] "Iteration 333"
## [1] "Iteration 334"
## [1] "Iteration 335"
## [1] "Iteration 335: objective function value is 2.269600"
```



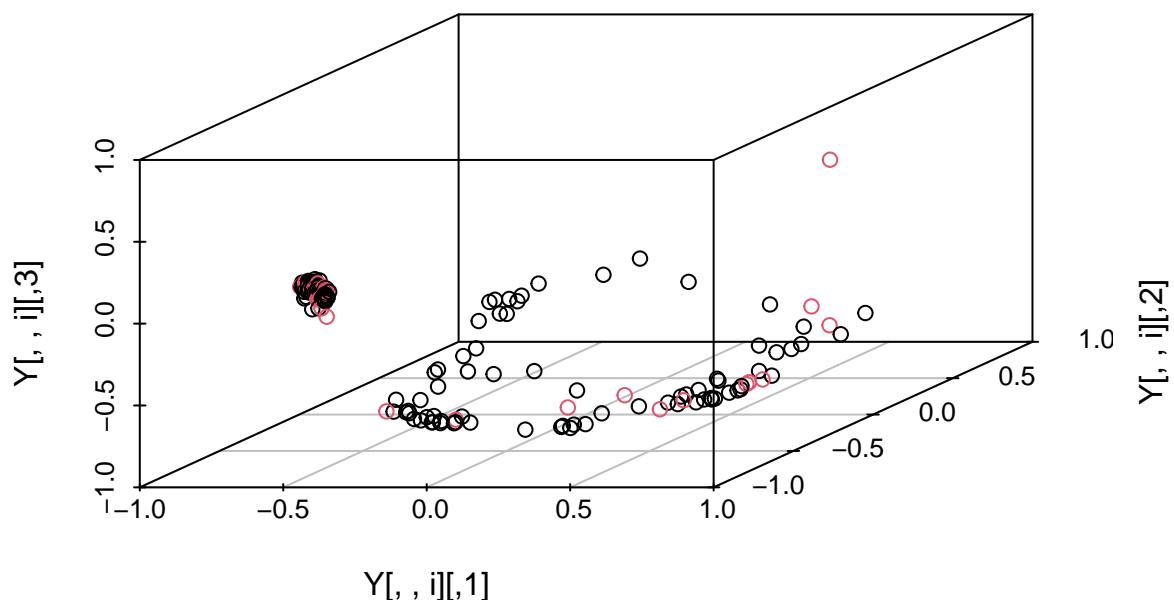
```
## [1] "Iteration 336"
## [1] "Iteration 337"
## [1] "Iteration 338"
## [1] "Iteration 339"
## [1] "Iteration 340"
## [1] "Iteration 340: objective function value is 2.309459"
```



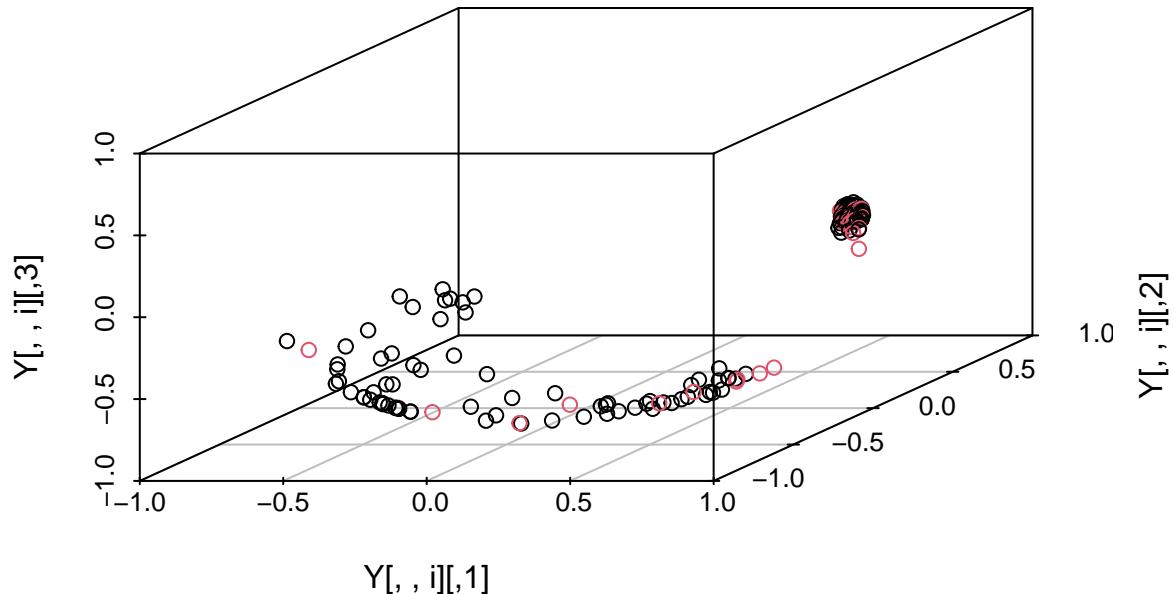
```
## [1] "Iteration 341"
## [1] "Iteration 342"
## [1] "Iteration 343"
## [1] "Iteration 344"
## [1] "Iteration 345"
## [1] "Iteration 345: objective function value is 2.267474"
```



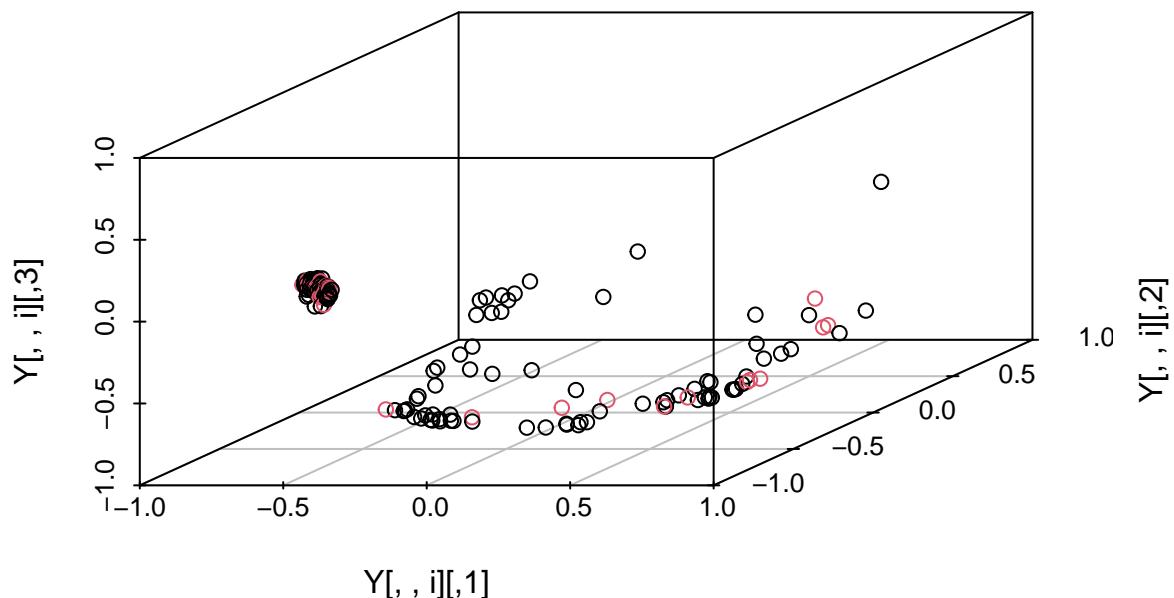
```
## [1] "Iteration 346"
## [1] "Iteration 347"
## [1] "Iteration 348"
## [1] "Iteration 349"
## [1] "Iteration 350"
## [1] "Iteration 350: objective function value is 2.307646"
```



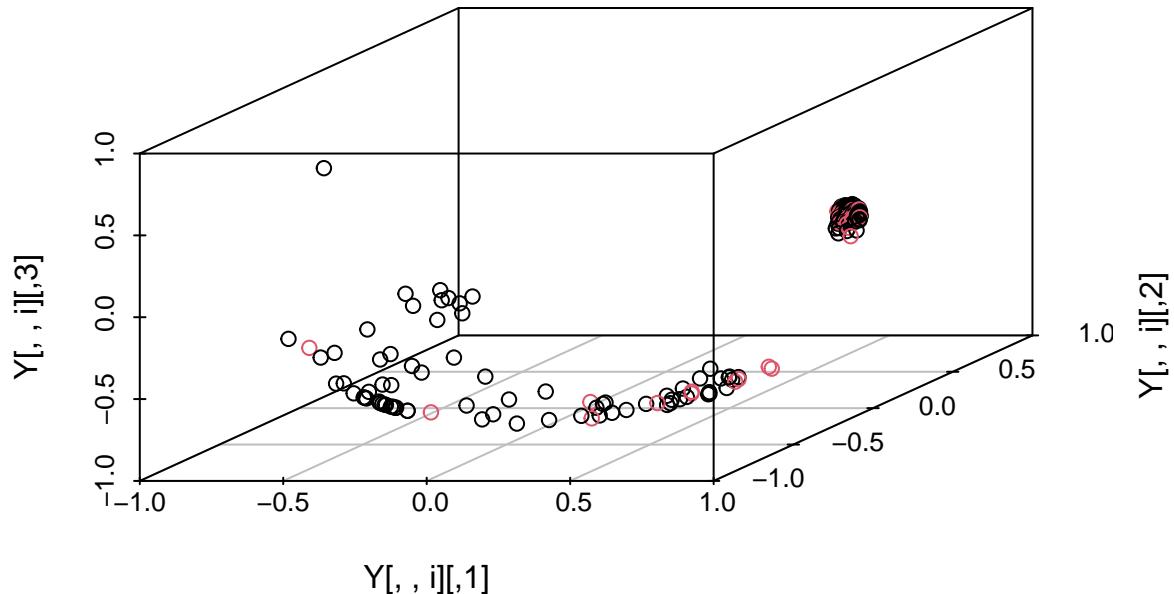
```
## [1] "Iteration 351"
## [1] "Iteration 352"
## [1] "Iteration 353"
## [1] "Iteration 354"
## [1] "Iteration 355"
## [1] "Iteration 355: objective function value is 2.266263"
```



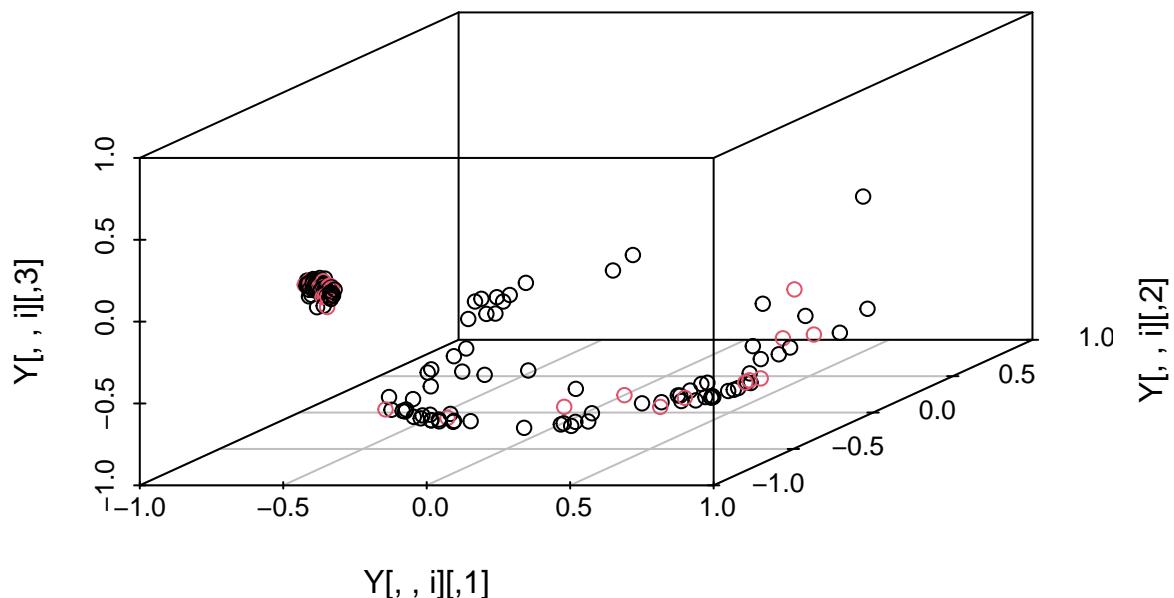
```
## [1] "Iteration 356"
## [1] "Iteration 357"
## [1] "Iteration 358"
## [1] "Iteration 359"
## [1] "Iteration 360"
## [1] "Iteration 360: objective function value is 2.287564"
```



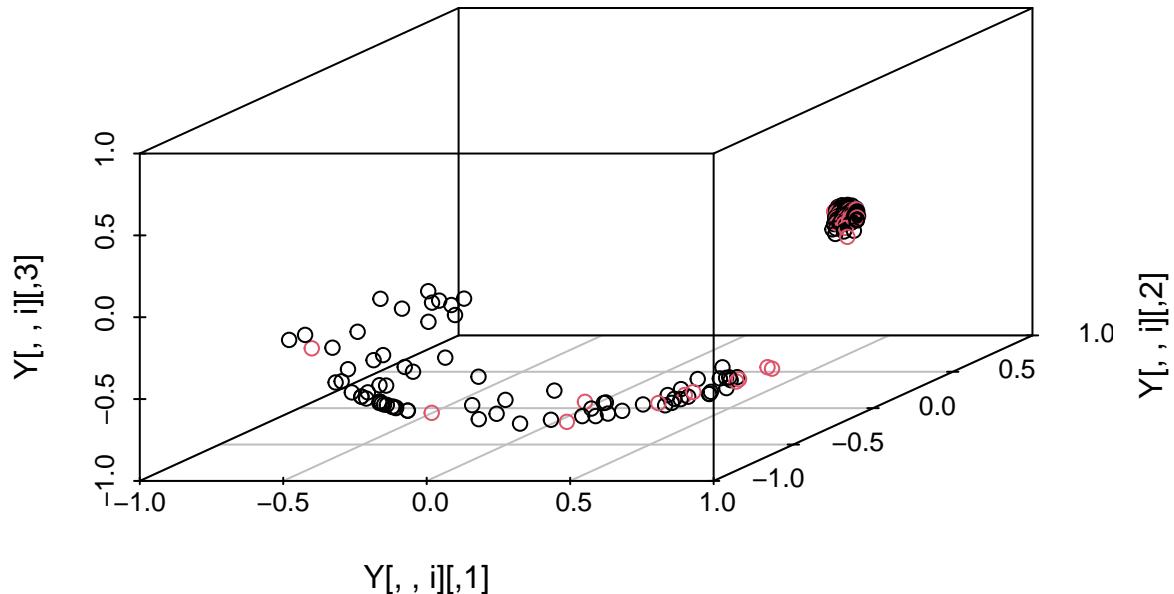
```
## [1] "Iteration 361"
## [1] "Iteration 362"
## [1] "Iteration 363"
## [1] "Iteration 364"
## [1] "Iteration 365"
## [1] "Iteration 365: objective function value is 2.264571"
```



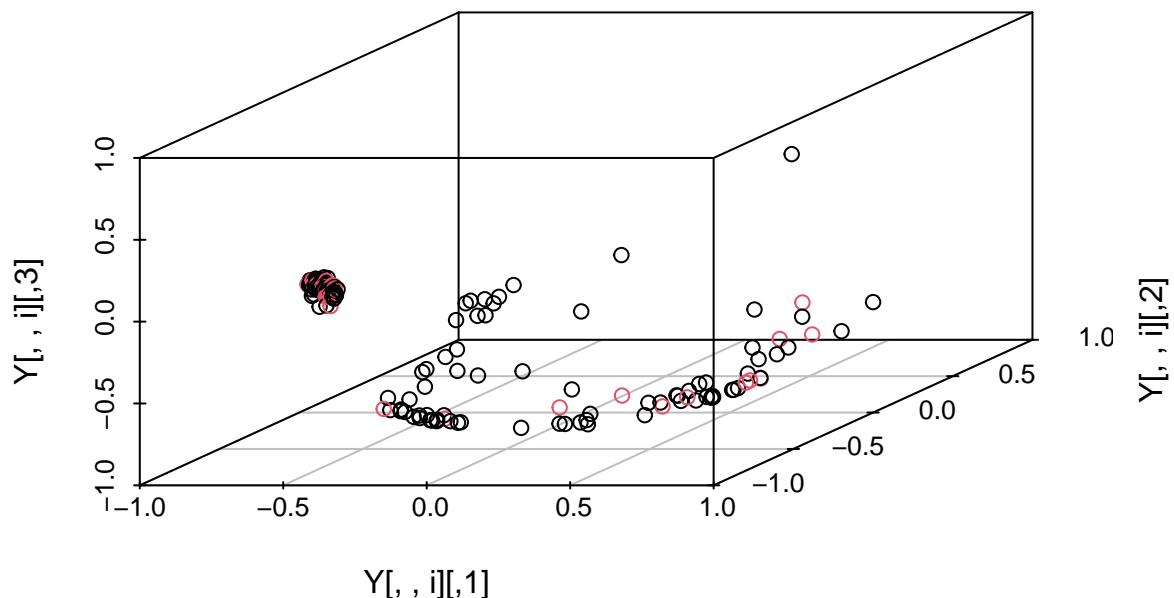
```
## [1] "Iteration 366"
## [1] "Iteration 367"
## [1] "Iteration 368"
## [1] "Iteration 369"
## [1] "Iteration 370"
## [1] "Iteration 370: objective function value is 2.287202"
```



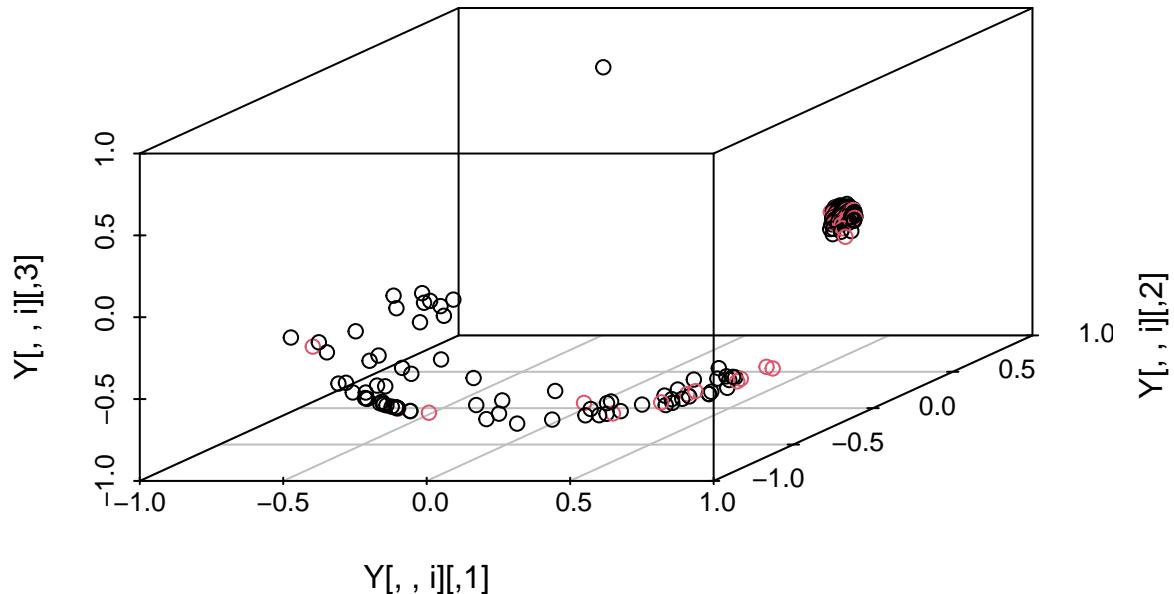
```
## [1] "Iteration 371"
## [1] "Iteration 372"
## [1] "Iteration 373"
## [1] "Iteration 374"
## [1] "Iteration 375"
## [1] "Iteration 375: objective function value is 2.270858"
```



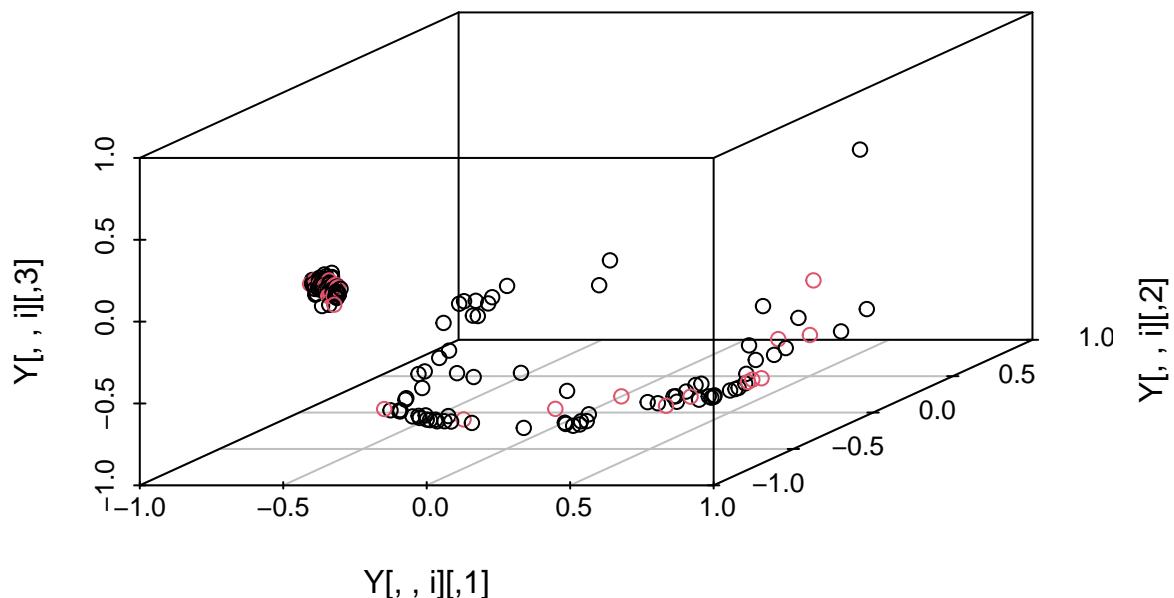
```
## [1] "Iteration 376"
## [1] "Iteration 377"
## [1] "Iteration 378"
## [1] "Iteration 379"
## [1] "Iteration 380"
## [1] "Iteration 380: objective function value is 2.277742"
```



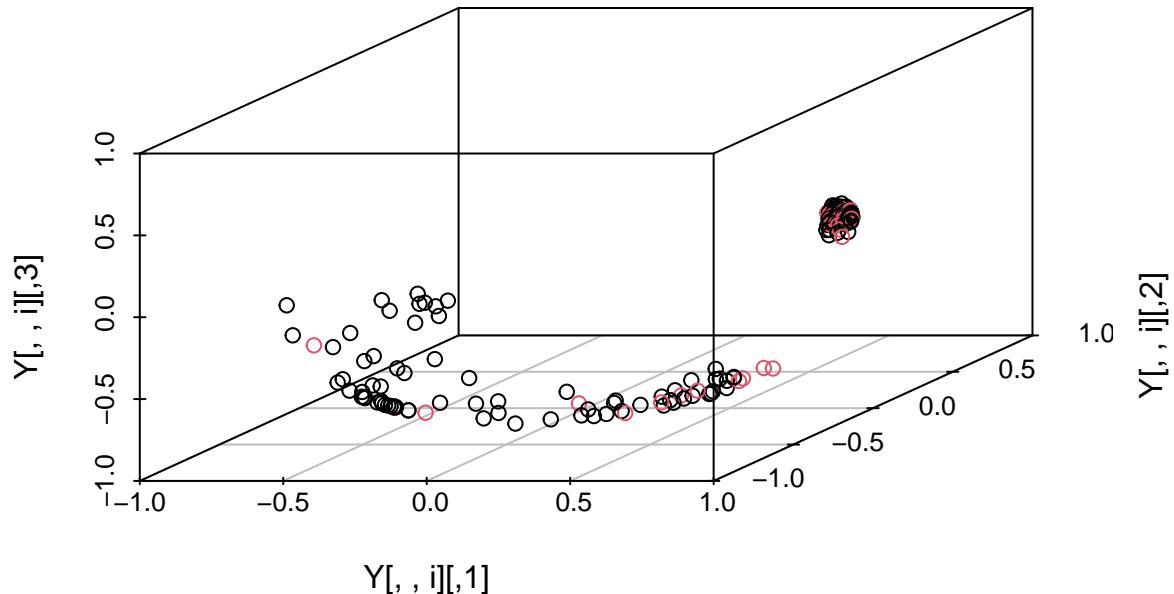
```
## [1] "Iteration 381"
## [1] "Iteration 382"
## [1] "Iteration 383"
## [1] "Iteration 384"
## [1] "Iteration 385"
## [1] "Iteration 385: objective function value is 2.263674"
```



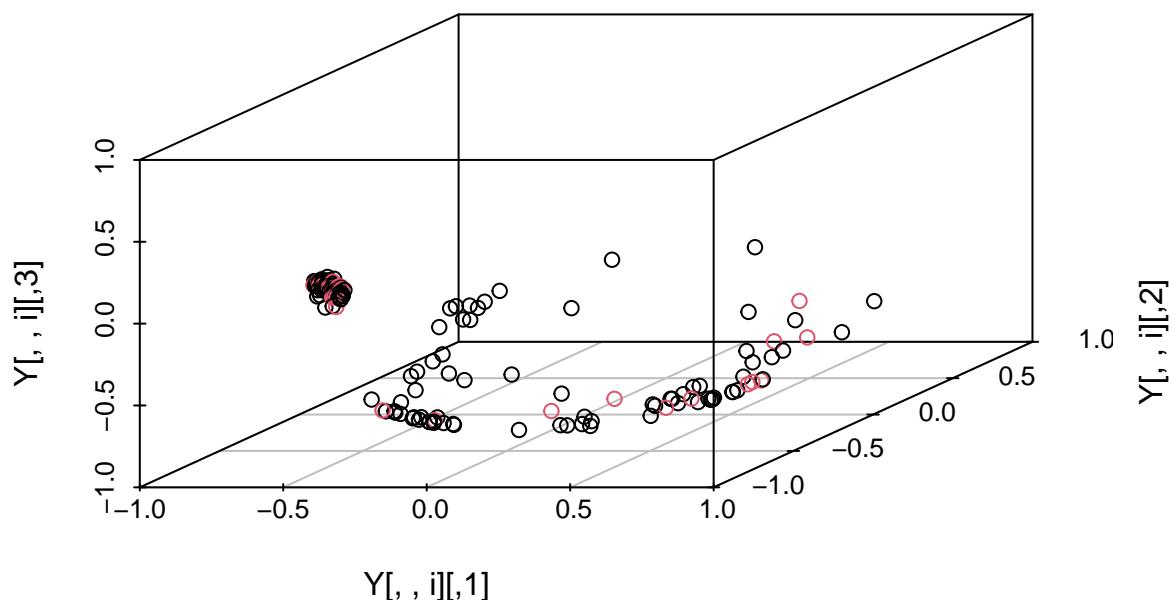
```
## [1] "Iteration 386"
## [1] "Iteration 387"
## [1] "Iteration 388"
## [1] "Iteration 389"
## [1] "Iteration 390"
## [1] "Iteration 390: objective function value is 2.279406"
```



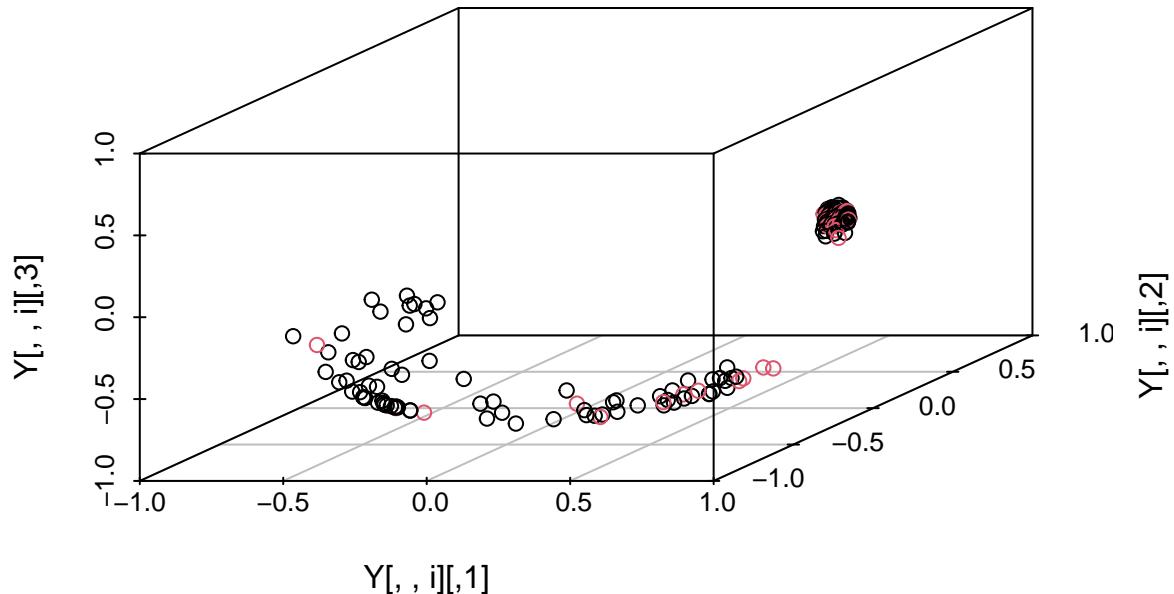
```
## [1] "Iteration 391"
## [1] "Iteration 392"
## [1] "Iteration 393"
## [1] "Iteration 394"
## [1] "Iteration 395"
## [1] "Iteration 395: objective function value is 2.260370"
```



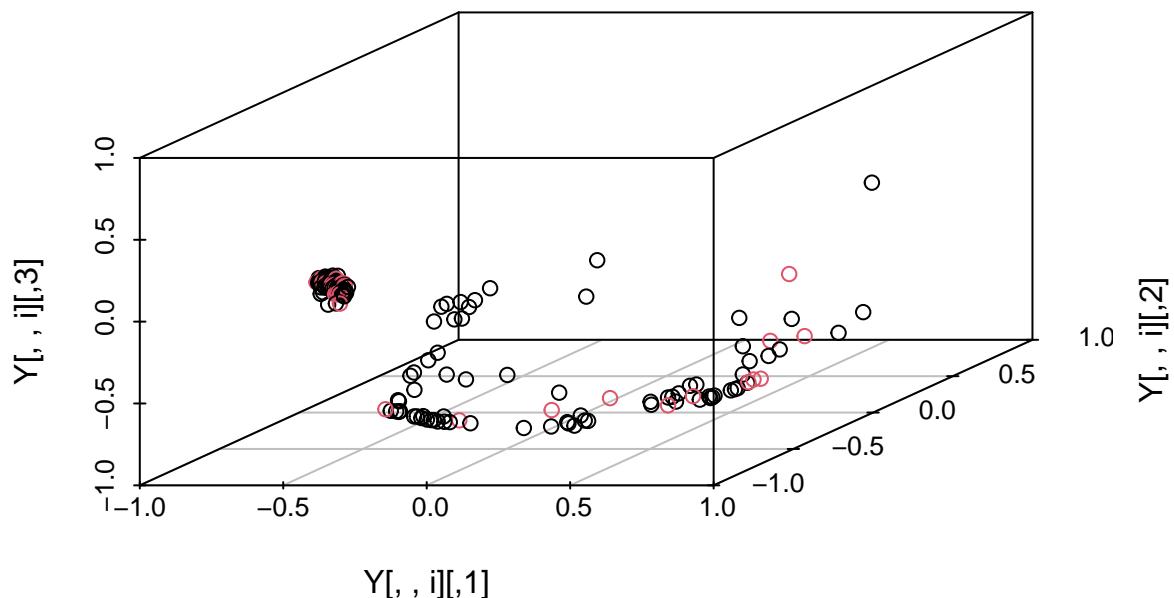
```
## [1] "Iteration 396"
## [1] "Iteration 397"
## [1] "Iteration 398"
## [1] "Iteration 399"
## [1] "Iteration 400"
## [1] "Iteration 400: objective function value is 2.270964"
```



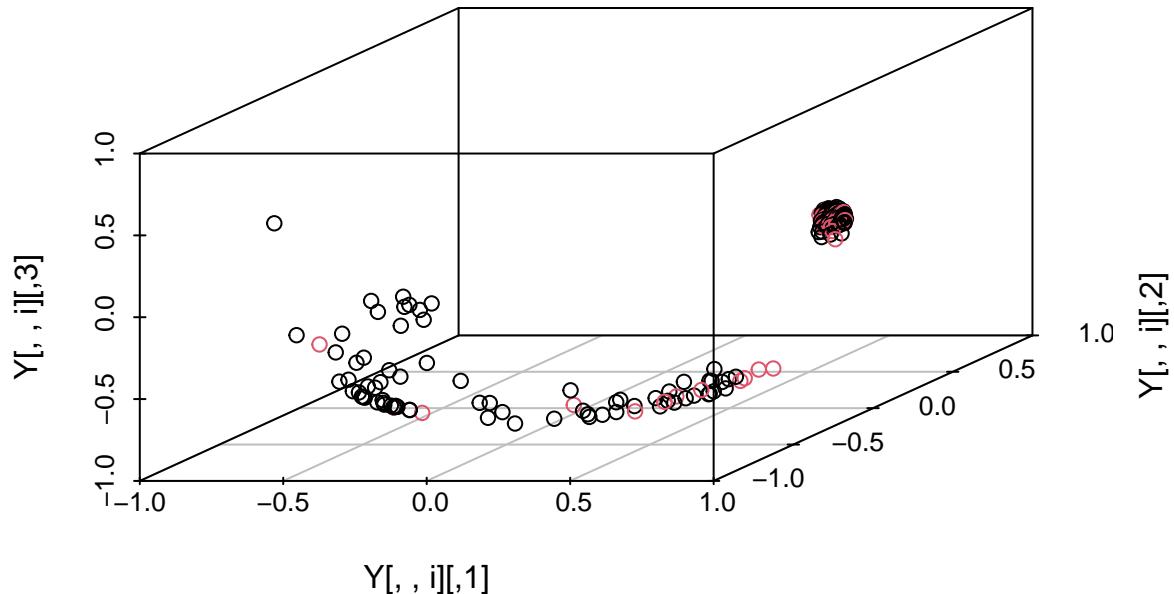
```
## [1] "Iteration 401"
## [1] "Iteration 402"
## [1] "Iteration 403"
## [1] "Iteration 404"
## [1] "Iteration 405"
## [1] "Iteration 405: objective function value is 2.267793"
```



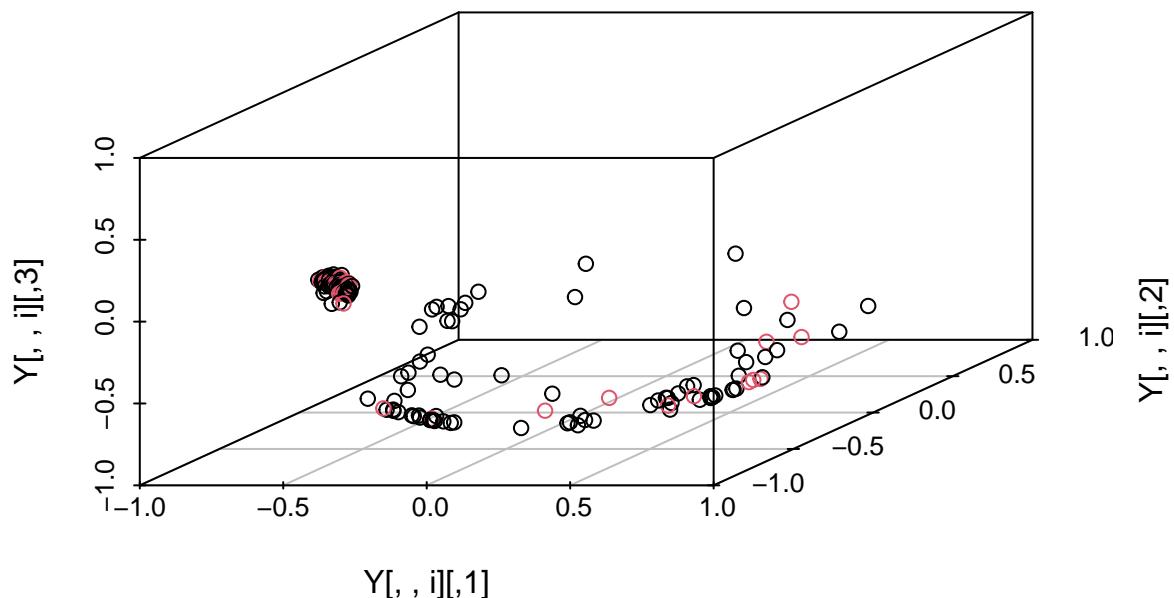
```
## [1] "Iteration 406"
## [1] "Iteration 407"
## [1] "Iteration 408"
## [1] "Iteration 409"
## [1] "Iteration 410"
## [1] "Iteration 410: objective function value is 2.275430"
```



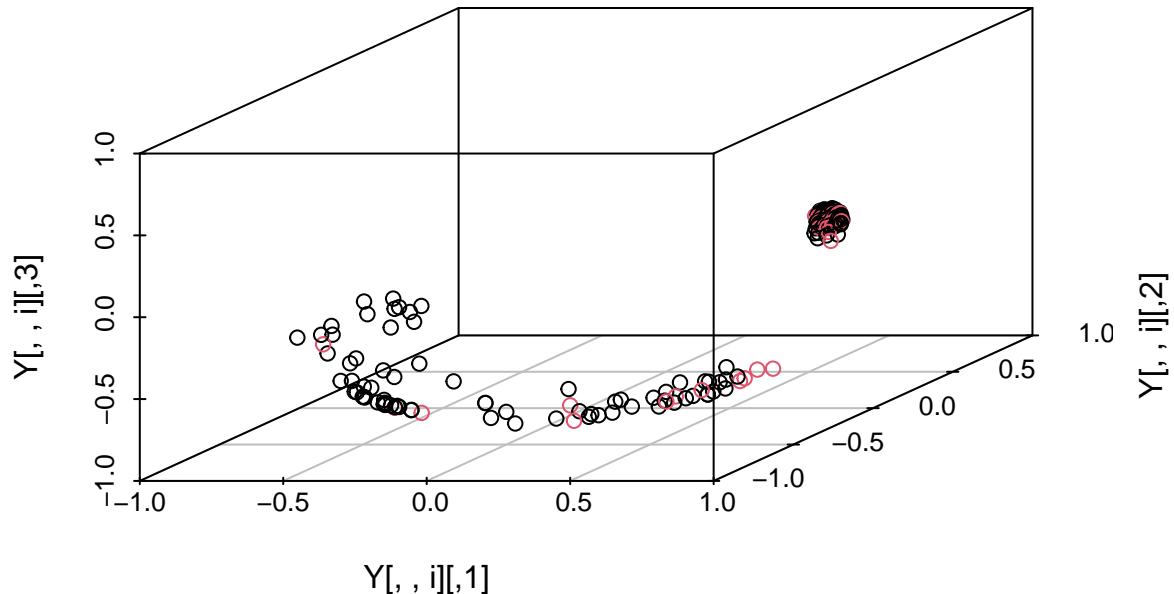
```
## [1] "Iteration 411"
## [1] "Iteration 412"
## [1] "Iteration 413"
## [1] "Iteration 414"
## [1] "Iteration 415"
## [1] "Iteration 415: objective function value is 2.269214"
```



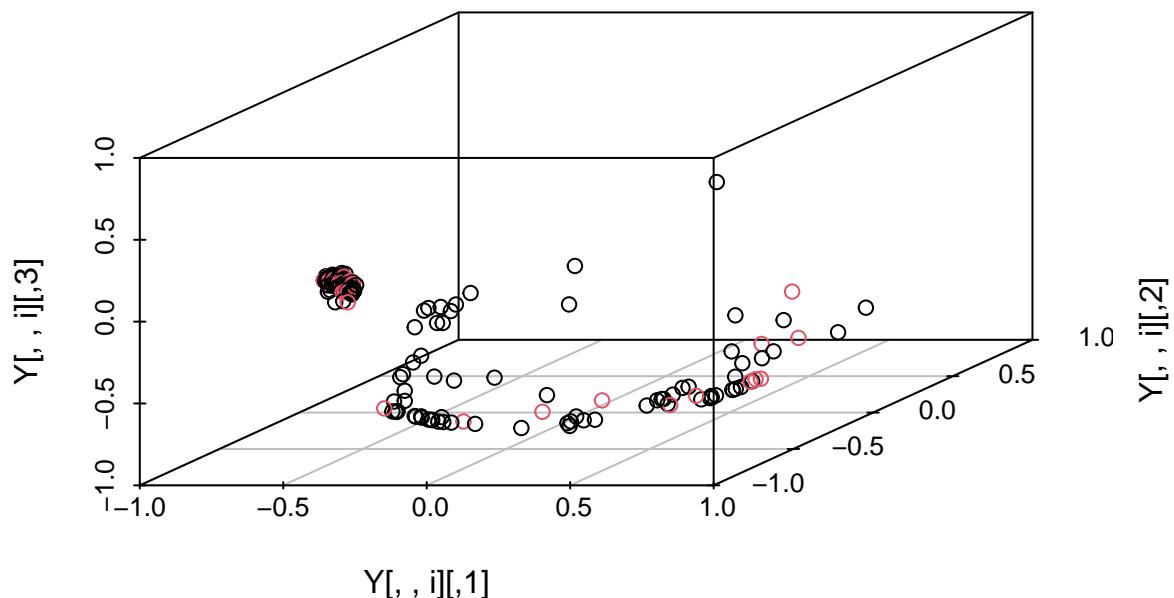
```
## [1] "Iteration 416"
## [1] "Iteration 417"
## [1] "Iteration 418"
## [1] "Iteration 419"
## [1] "Iteration 420"
## [1] "Iteration 420: objective function value is 2.268478"
```



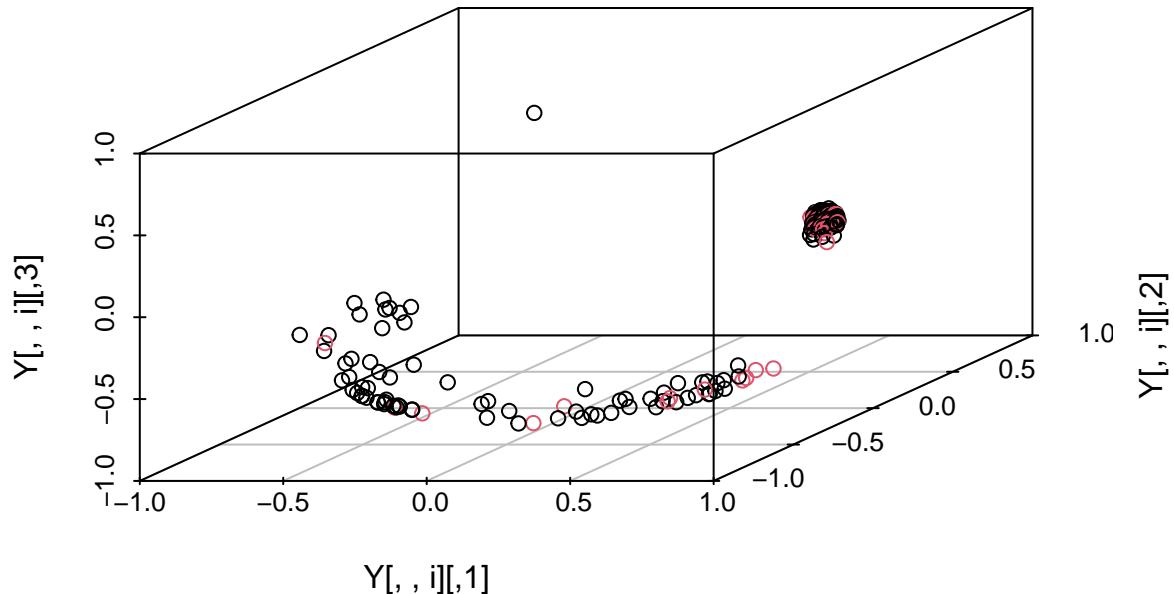
```
## [1] "Iteration 421"
## [1] "Iteration 422"
## [1] "Iteration 423"
## [1] "Iteration 424"
## [1] "Iteration 425"
## [1] "Iteration 425: objective function value is 2.279207"
```



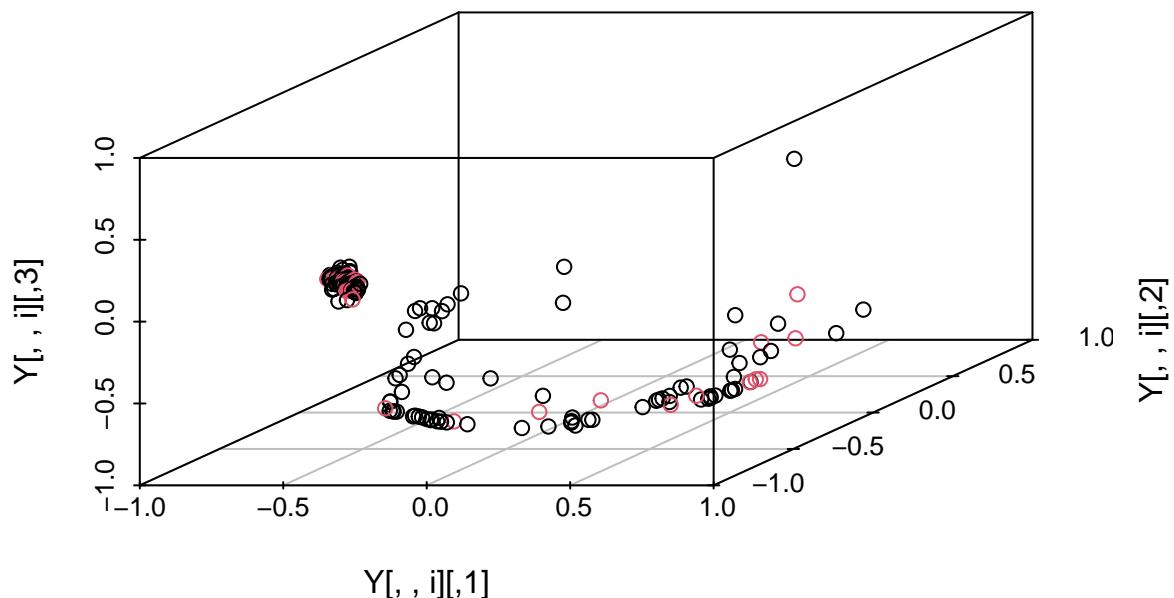
```
## [1] "Iteration 426"
## [1] "Iteration 427"
## [1] "Iteration 428"
## [1] "Iteration 429"
## [1] "Iteration 430"
## [1] "Iteration 430: objective function value is 2.277040"
```



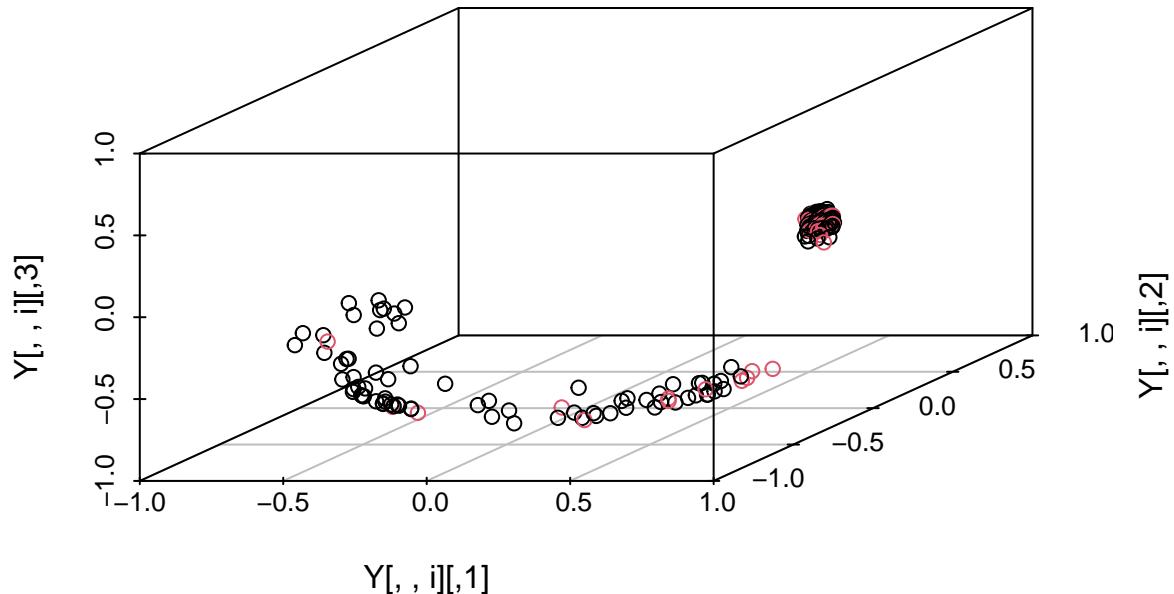
```
## [1] "Iteration 431"
## [1] "Iteration 432"
## [1] "Iteration 433"
## [1] "Iteration 434"
## [1] "Iteration 435"
## [1] "Iteration 435: objective function value is 2.267550"
```



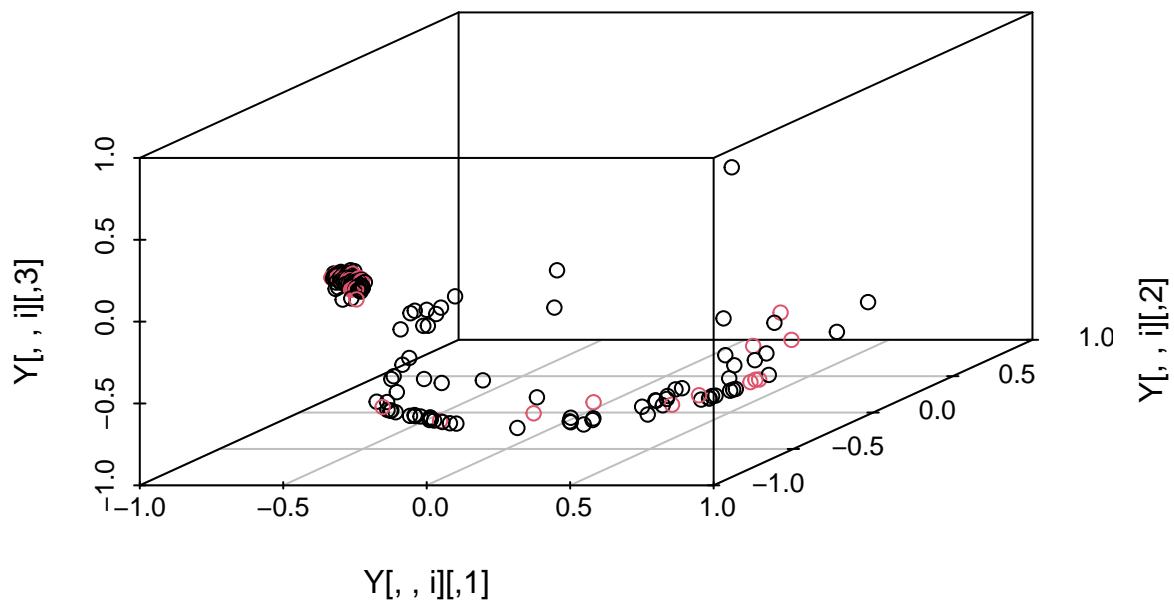
```
## [1] "Iteration 436"
## [1] "Iteration 437"
## [1] "Iteration 438"
## [1] "Iteration 439"
## [1] "Iteration 440"
## [1] "Iteration 440: objective function value is 2.269605"
```



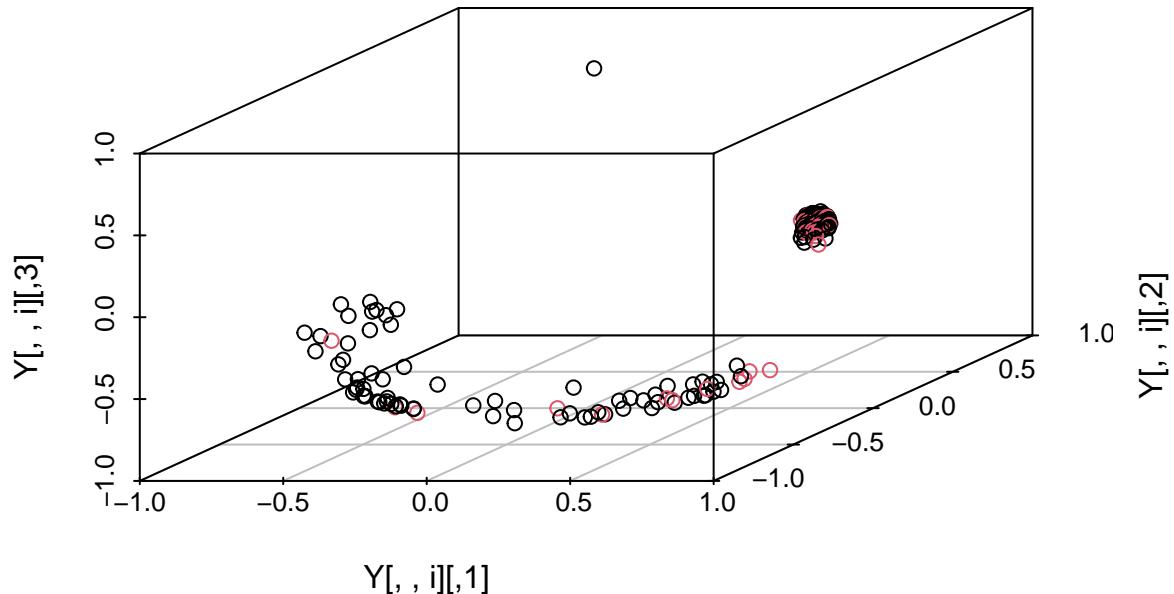
```
## [1] "Iteration 441"
## [1] "Iteration 442"
## [1] "Iteration 443"
## [1] "Iteration 444"
## [1] "Iteration 445"
## [1] "Iteration 445: objective function value is 2.273968"
```



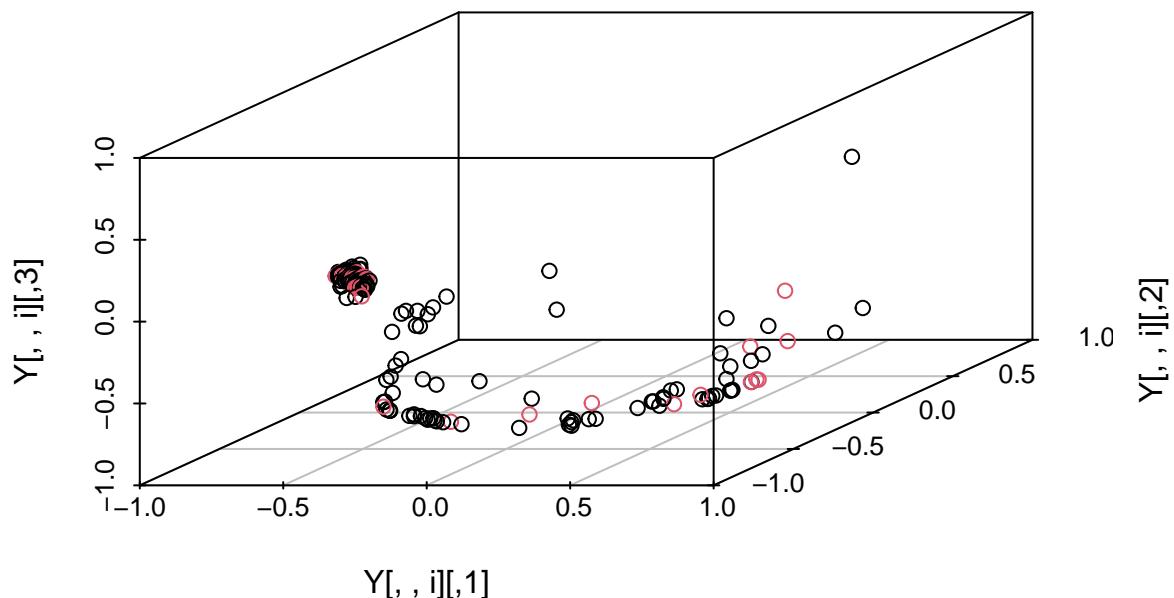
```
## [1] "Iteration 446"
## [1] "Iteration 447"
## [1] "Iteration 448"
## [1] "Iteration 449"
## [1] "Iteration 450"
## [1] "Iteration 450: objective function value is 2.267743"
```



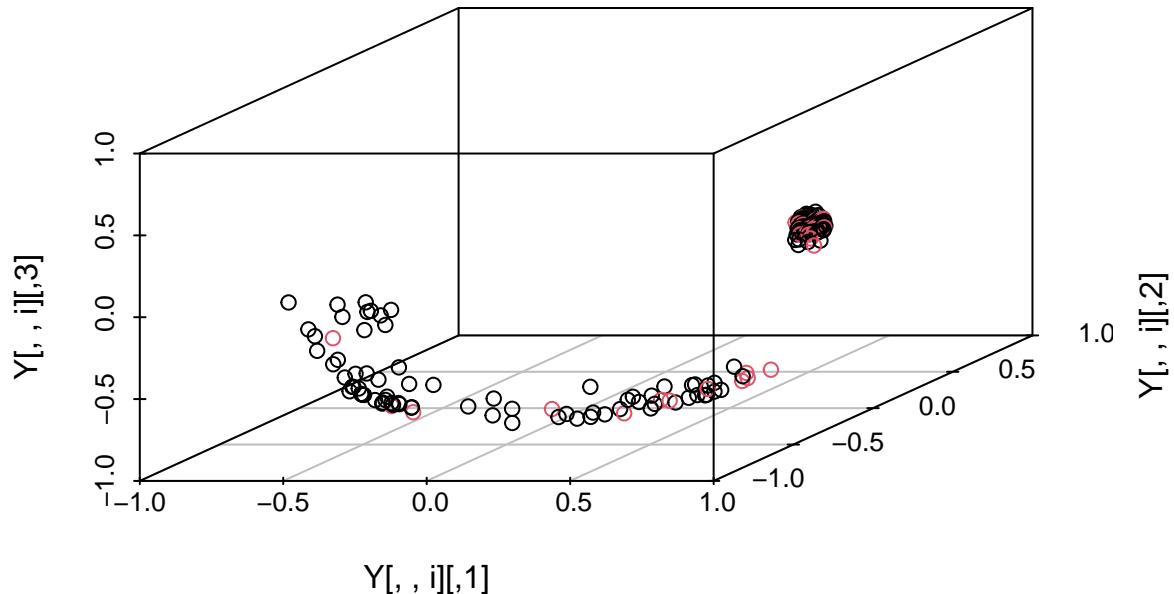
```
## [1] "Iteration 451"
## [1] "Iteration 452"
## [1] "Iteration 453"
## [1] "Iteration 454"
## [1] "Iteration 455"
## [1] "Iteration 455: objective function value is 2.272376"
```



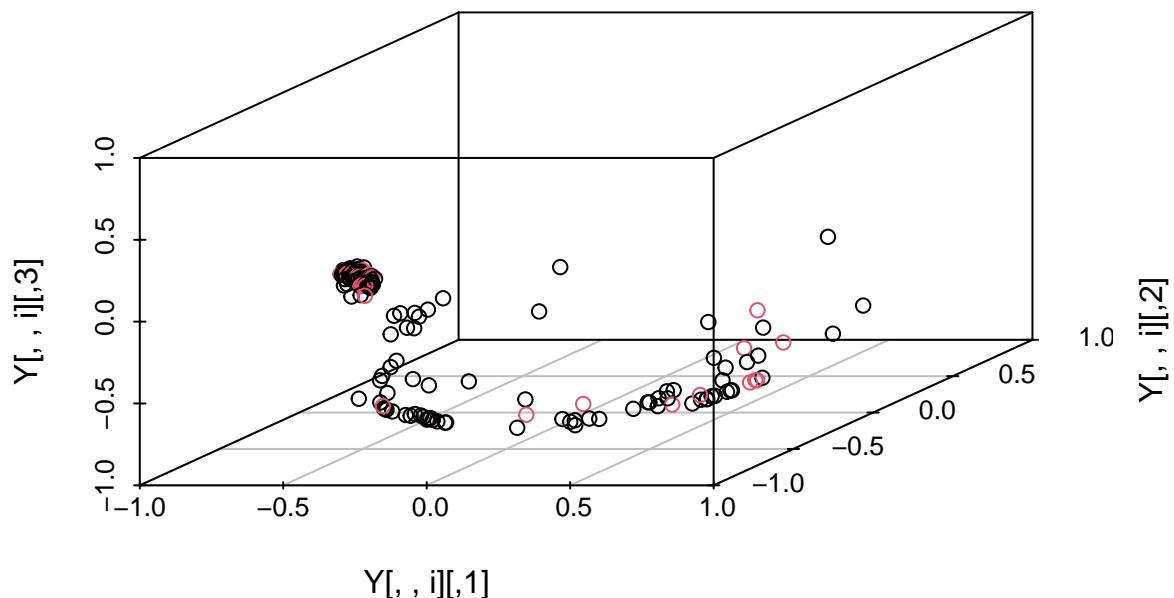
```
## [1] "Iteration 456"
## [1] "Iteration 457"
## [1] "Iteration 458"
## [1] "Iteration 459"
## [1] "Iteration 460"
## [1] "Iteration 460: objective function value is 2.268328"
```



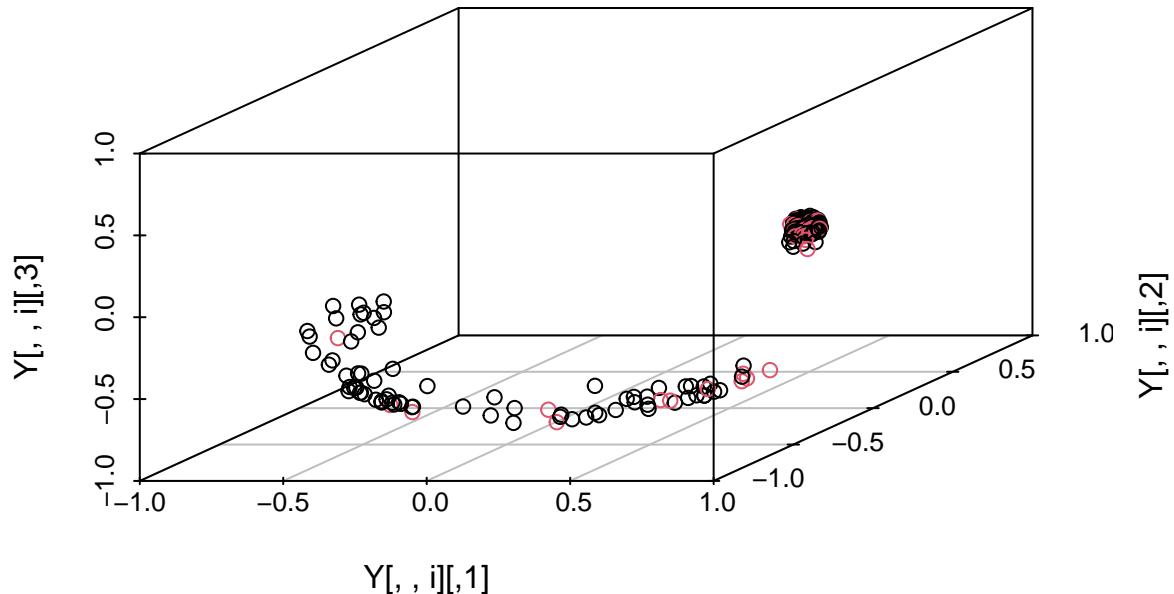
```
## [1] "Iteration 461"
## [1] "Iteration 462"
## [1] "Iteration 463"
## [1] "Iteration 464"
## [1] "Iteration 465"
## [1] "Iteration 465: objective function value is 2.269324"
```



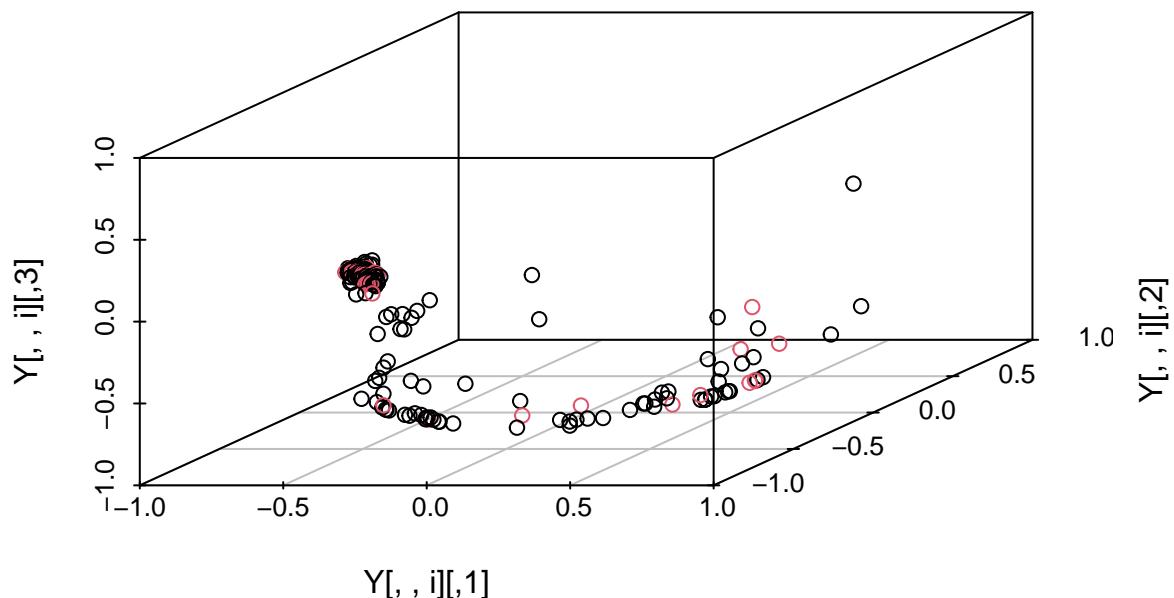
```
## [1] "Iteration 466"
## [1] "Iteration 467"
## [1] "Iteration 468"
## [1] "Iteration 469"
## [1] "Iteration 470"
## [1] "Iteration 470: objective function value is 2.266201"
```



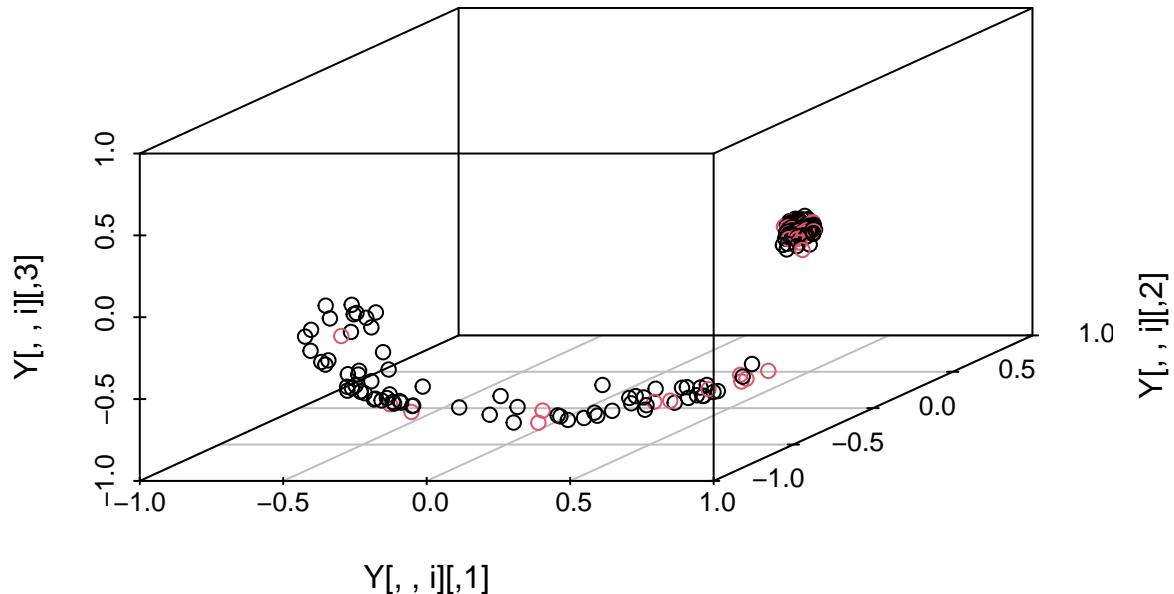
```
## [1] "Iteration 471"
## [1] "Iteration 472"
## [1] "Iteration 473"
## [1] "Iteration 474"
## [1] "Iteration 475"
## [1] "Iteration 475: objective function value is 2.283645"
```



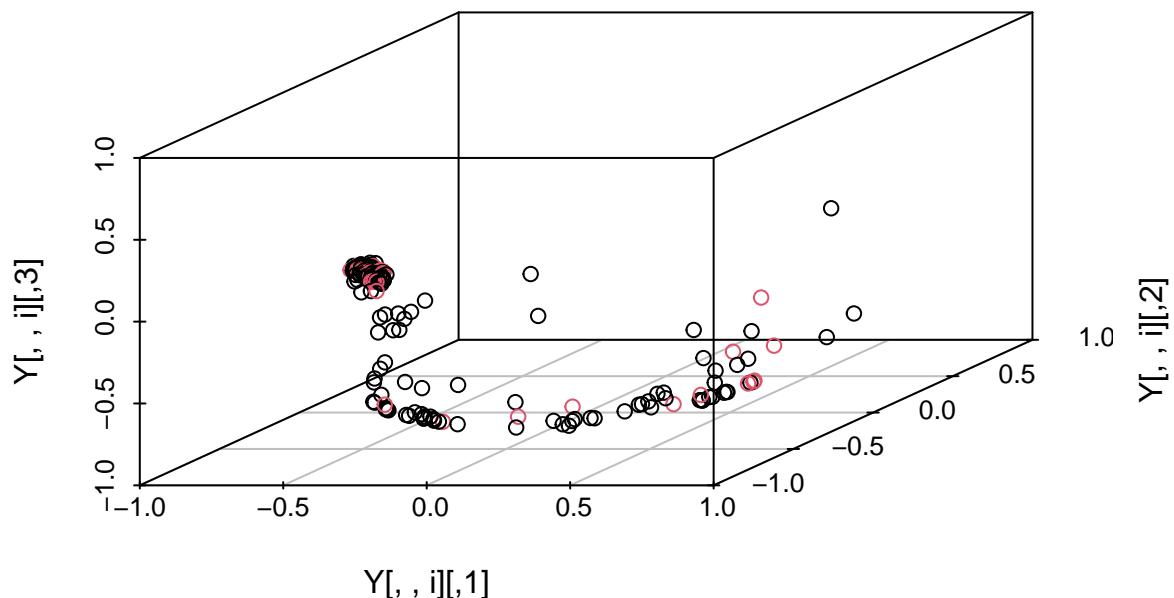
```
## [1] "Iteration 476"
## [1] "Iteration 477"
## [1] "Iteration 478"
## [1] "Iteration 479"
## [1] "Iteration 480"
## [1] "Iteration 480: objective function value is 2.269554"
```



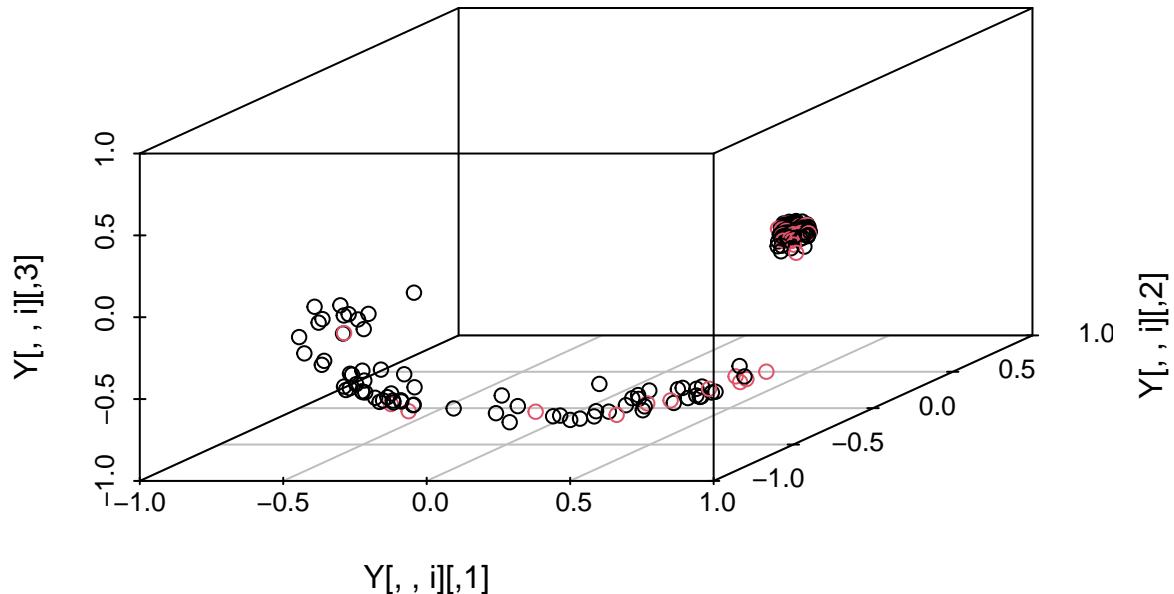
```
## [1] "Iteration 481"
## [1] "Iteration 482"
## [1] "Iteration 483"
## [1] "Iteration 484"
## [1] "Iteration 485"
## [1] "Iteration 485: objective function value is 2.275889"
```



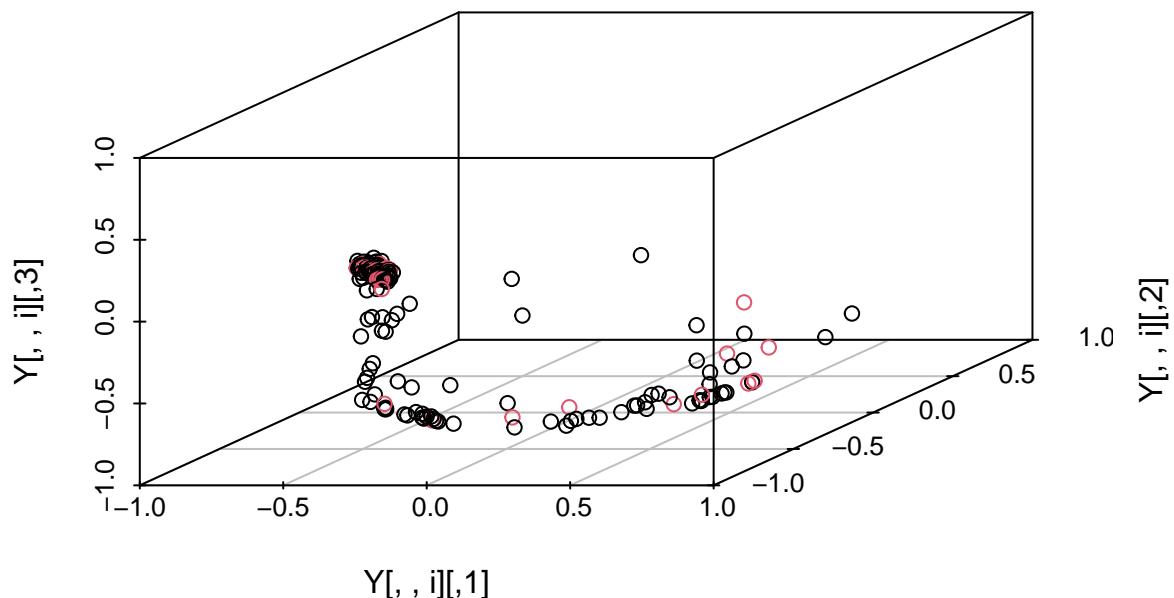
```
## [1] "Iteration 486"
## [1] "Iteration 487"
## [1] "Iteration 488"
## [1] "Iteration 489"
## [1] "Iteration 490"
## [1] "Iteration 490: objective function value is 2.265373"
```



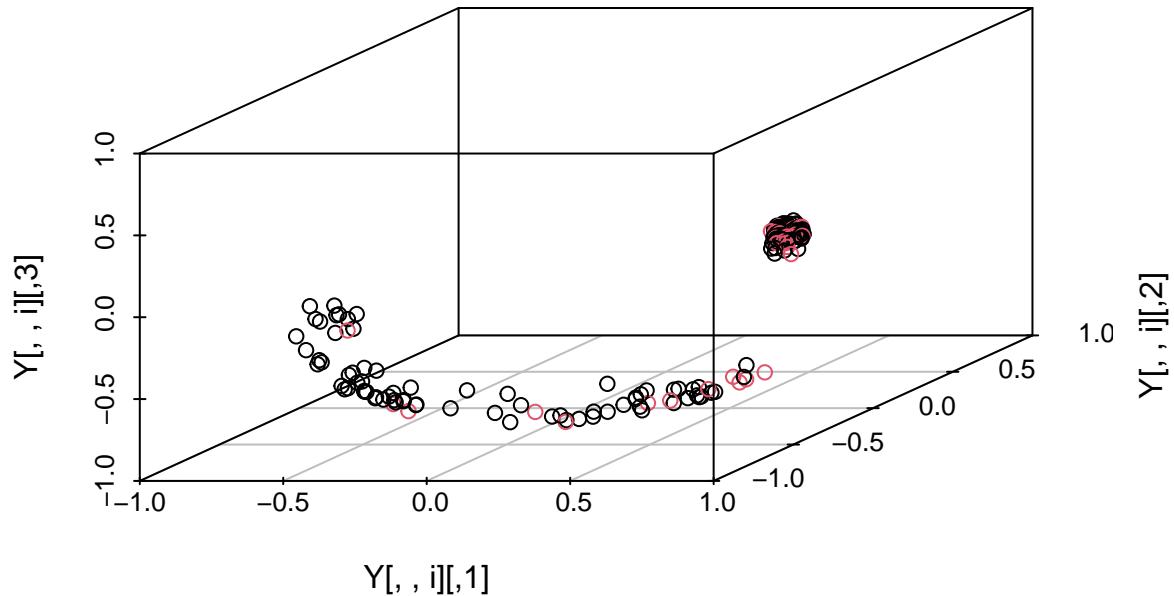
```
## [1] "Iteration 491"
## [1] "Iteration 492"
## [1] "Iteration 493"
## [1] "Iteration 494"
## [1] "Iteration 495"
## [1] "Iteration 495: objective function value is 2.282252"
```



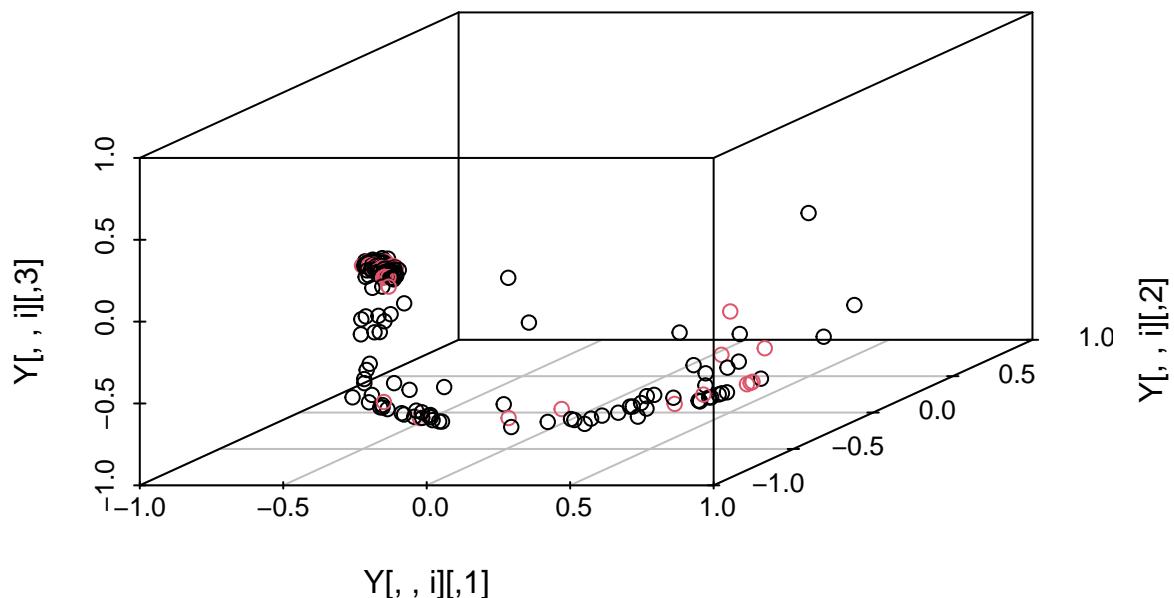
```
## [1] "Iteration 496"
## [1] "Iteration 497"
## [1] "Iteration 498"
## [1] "Iteration 499"
## [1] "Iteration 500"
## [1] "Iteration 500: objective function value is 2.262589"
```



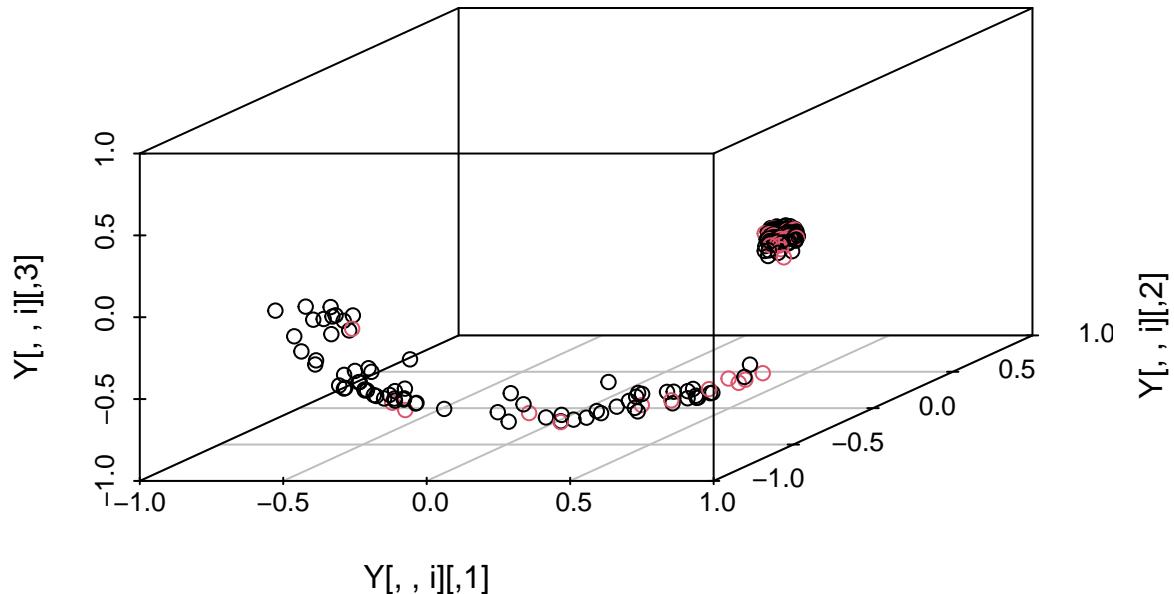
```
## [1] "Iteration 501"
## [1] "Iteration 502"
## [1] "Iteration 503"
## [1] "Iteration 504"
## [1] "Iteration 505"
## [1] "Iteration 505: objective function value is 2.270790"
```



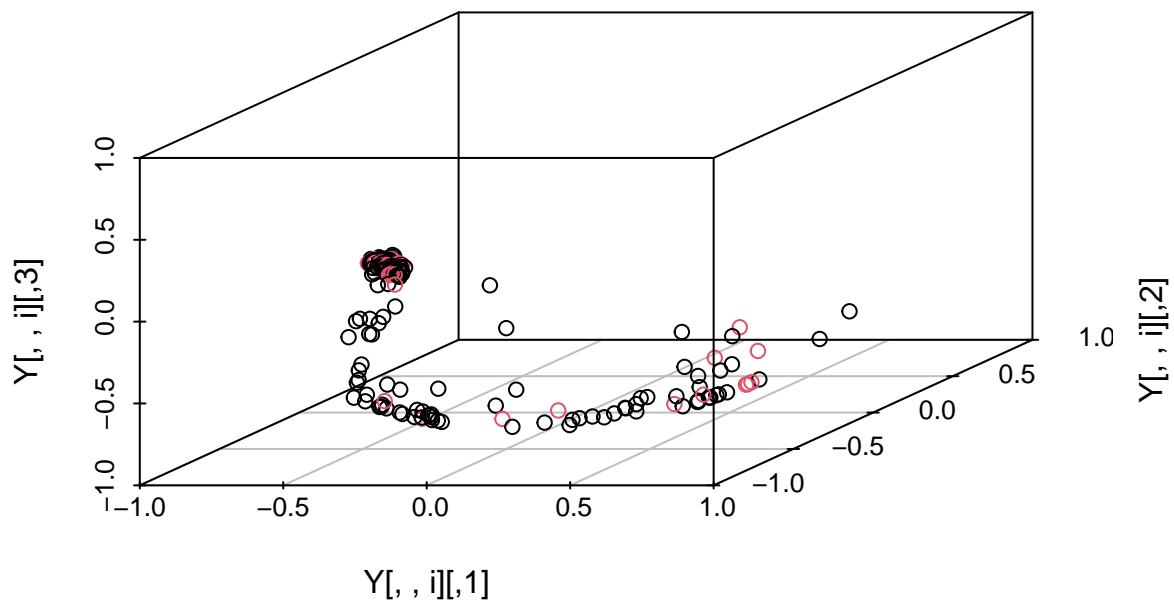
```
## [1] "Iteration 506"
## [1] "Iteration 507"
## [1] "Iteration 508"
## [1] "Iteration 509"
## [1] "Iteration 510"
## [1] "Iteration 510: objective function value is 2.262102"
```



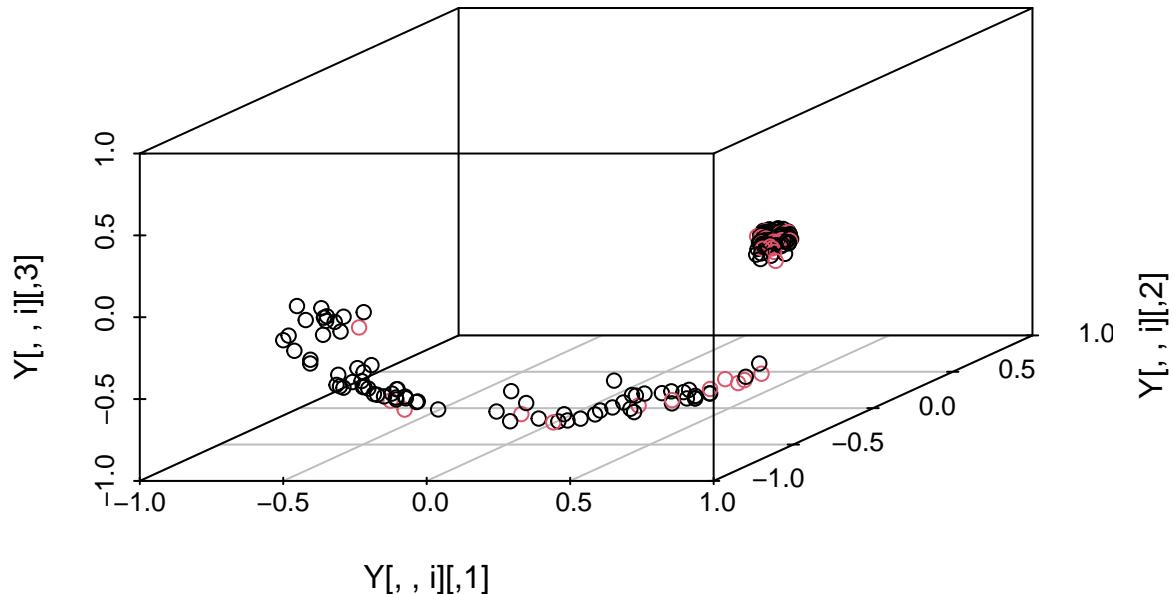
```
## [1] "Iteration 511"
## [1] "Iteration 512"
## [1] "Iteration 513"
## [1] "Iteration 514"
## [1] "Iteration 515"
## [1] "Iteration 515: objective function value is 2.282784"
```



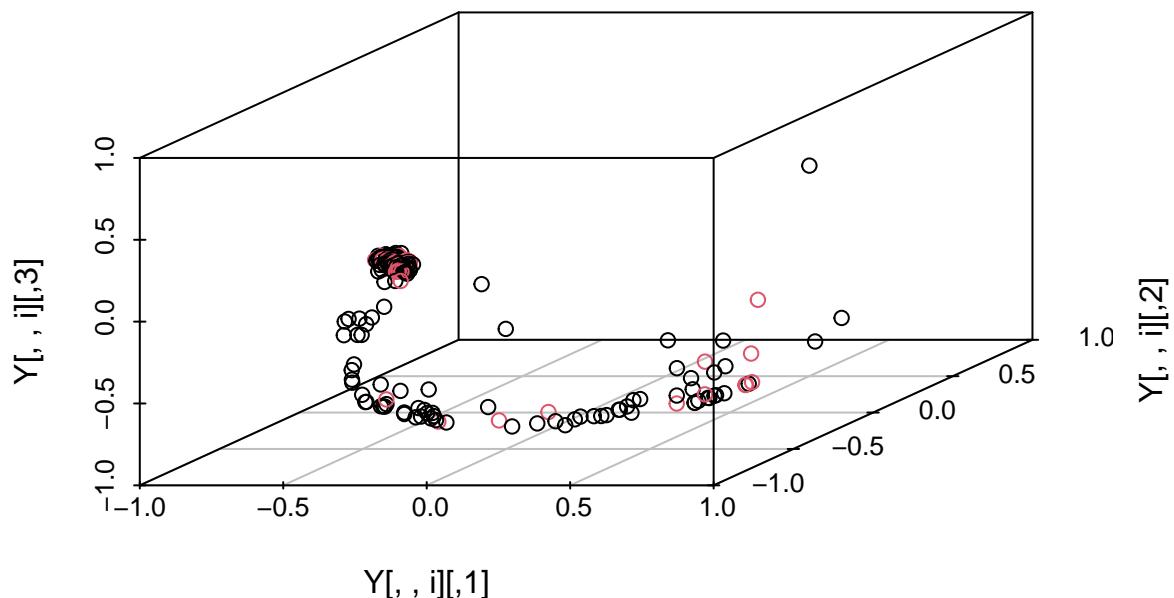
```
## [1] "Iteration 516"
## [1] "Iteration 517"
## [1] "Iteration 518"
## [1] "Iteration 519"
## [1] "Iteration 520"
## [1] "Iteration 520: objective function value is 2.256120"
```



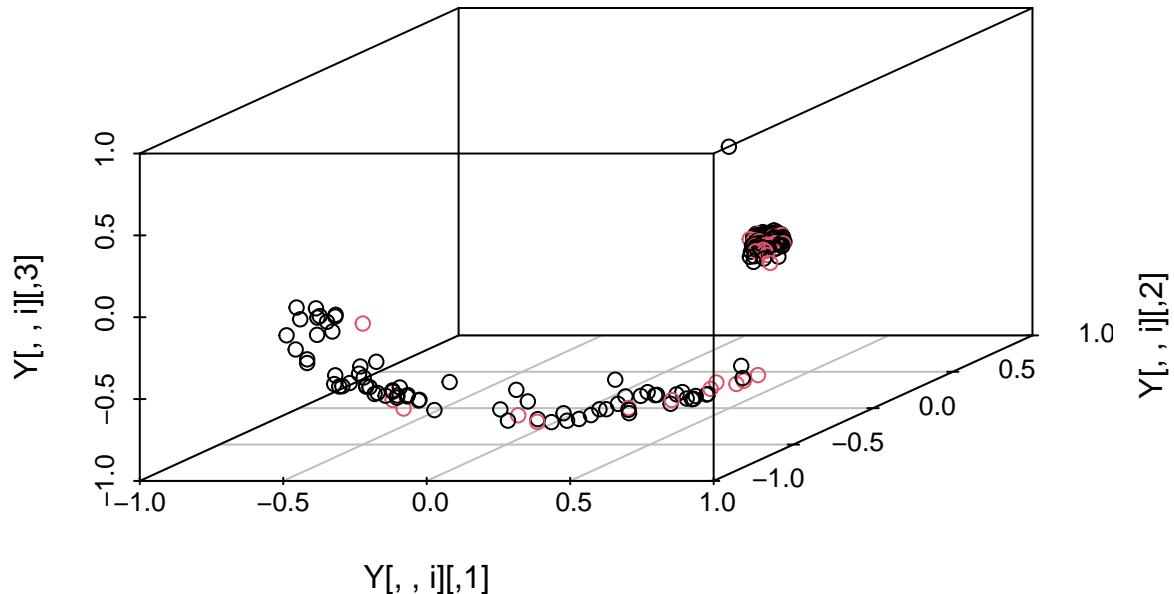
```
## [1] "Iteration 521"
## [1] "Iteration 522"
## [1] "Iteration 523"
## [1] "Iteration 524"
## [1] "Iteration 525"
## [1] "Iteration 525: objective function value is 2.286261"
```



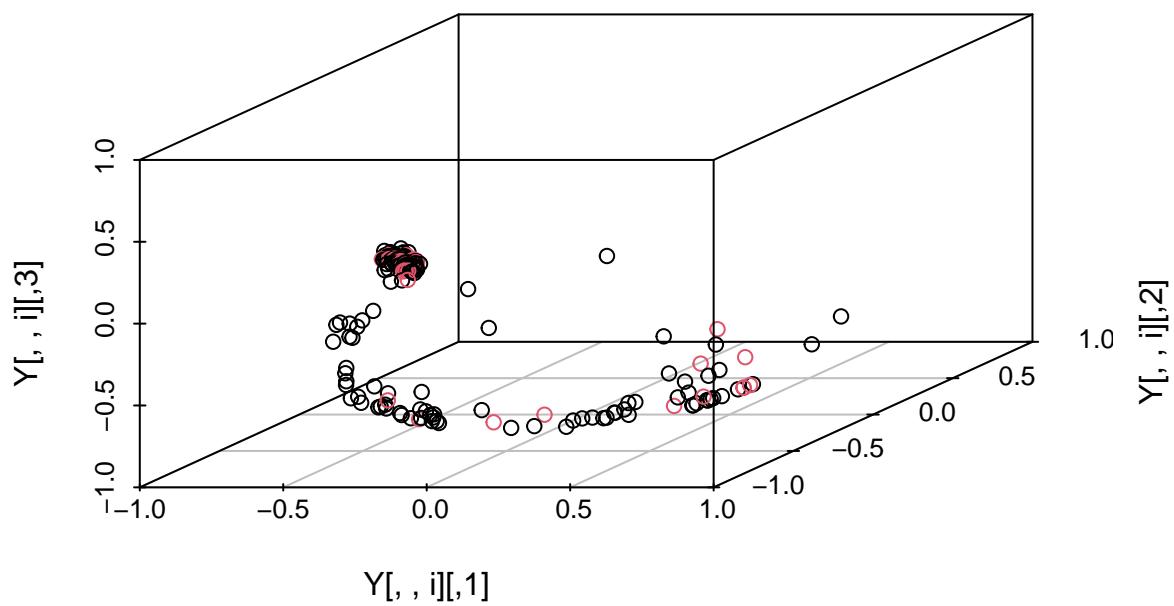
```
## [1] "Iteration 526"
## [1] "Iteration 527"
## [1] "Iteration 528"
## [1] "Iteration 529"
## [1] "Iteration 530"
## [1] "Iteration 530: objective function value is 2.259611"
```



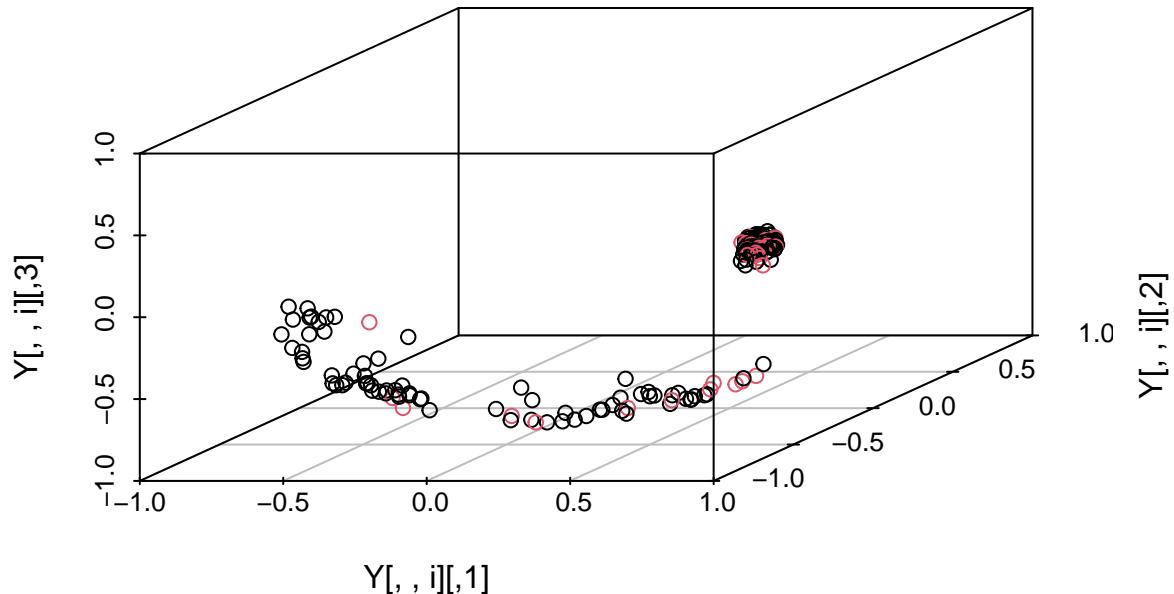
```
## [1] "Iteration 531"
## [1] "Iteration 532"
## [1] "Iteration 533"
## [1] "Iteration 534"
## [1] "Iteration 535"
## [1] "Iteration 535: objective function value is 2.285598"
```



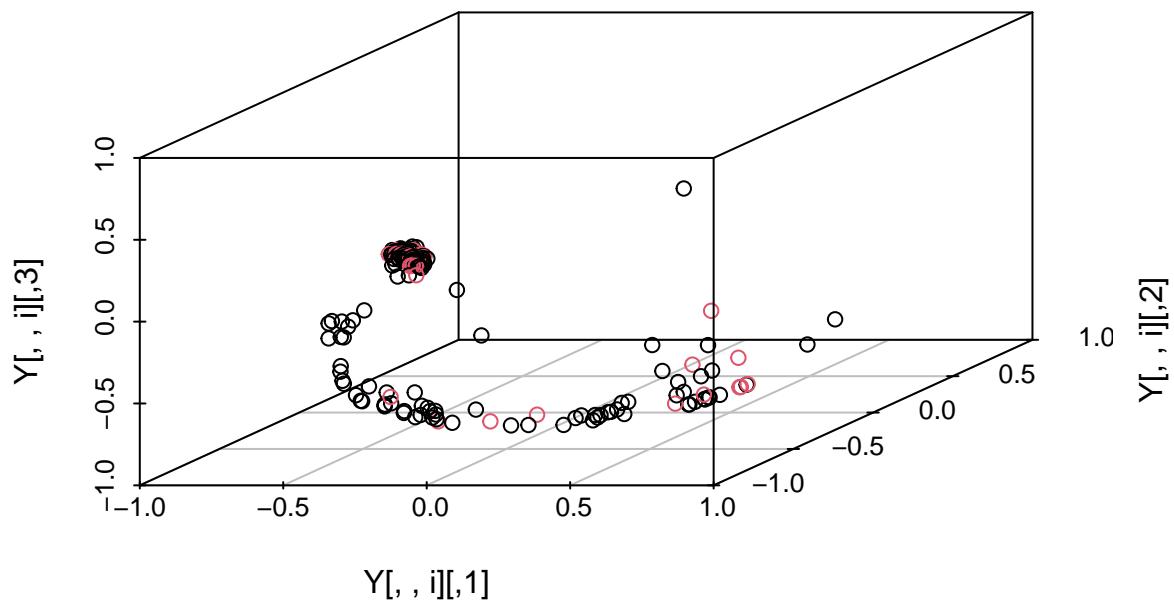
```
## [1] "Iteration 536"
## [1] "Iteration 537"
## [1] "Iteration 538"
## [1] "Iteration 539"
## [1] "Iteration 540"
## [1] "Iteration 540: objective function value is 2.257231"
```



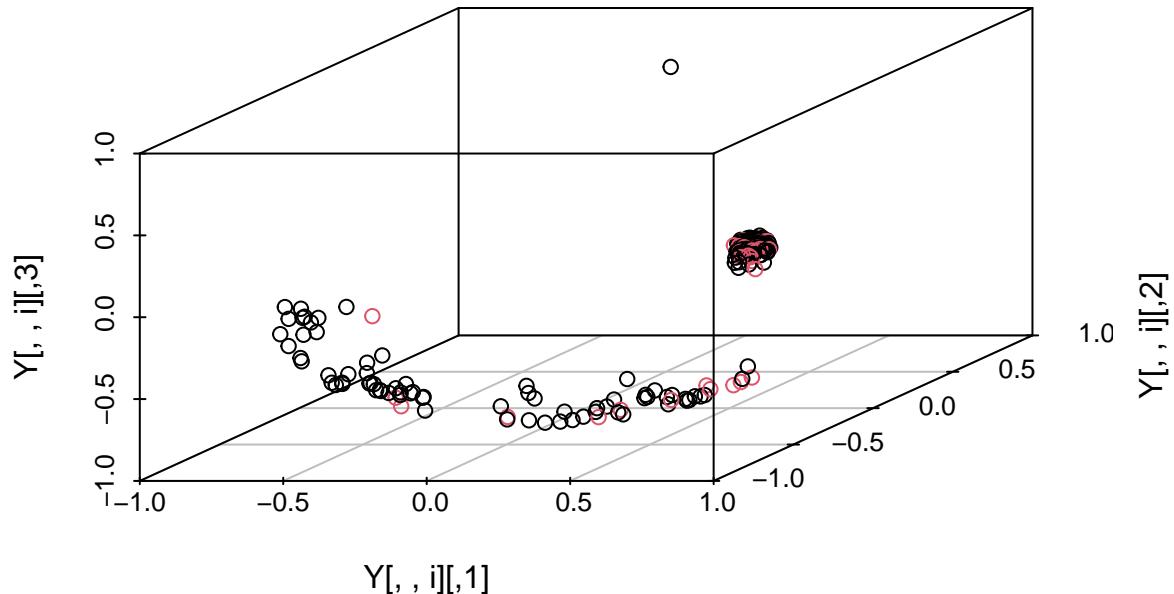
```
## [1] "Iteration 541"
## [1] "Iteration 542"
## [1] "Iteration 543"
## [1] "Iteration 544"
## [1] "Iteration 545"
## [1] "Iteration 545: objective function value is 2.281287"
```



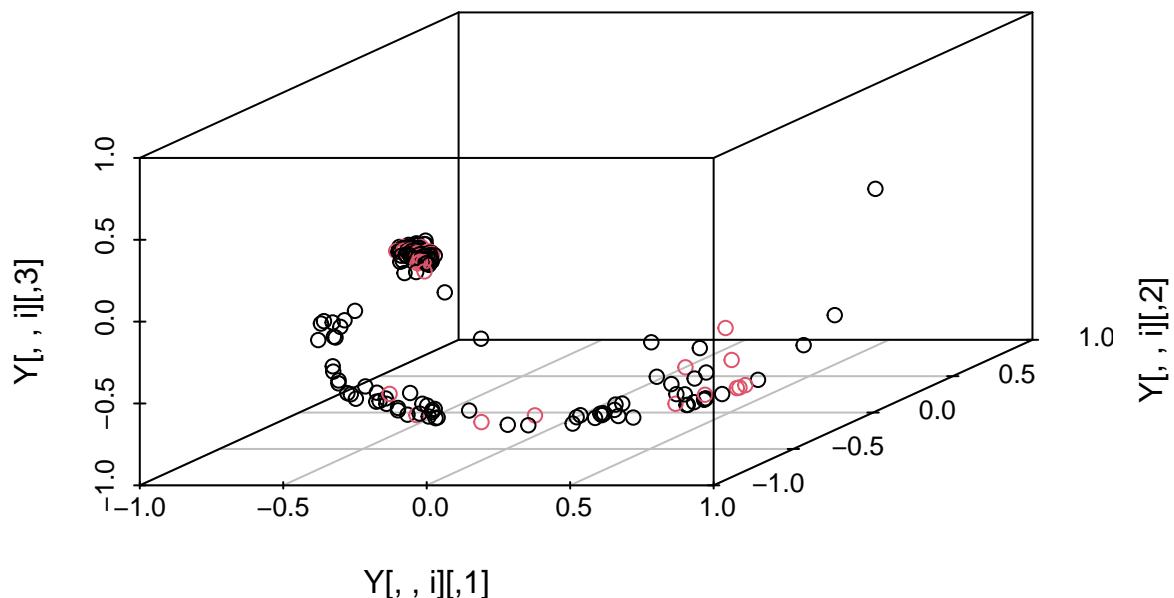
```
## [1] "Iteration 546"
## [1] "Iteration 547"
## [1] "Iteration 548"
## [1] "Iteration 549"
## [1] "Iteration 550"
## [1] "Iteration 550: objective function value is 2.257826"
```



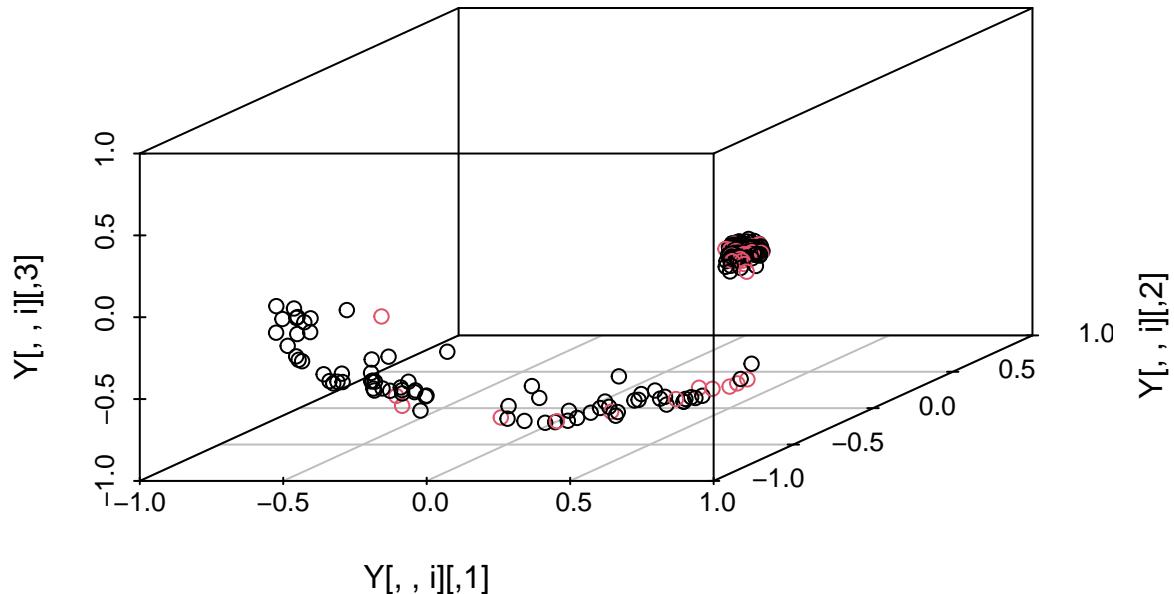
```
## [1] "Iteration 551"
## [1] "Iteration 552"
## [1] "Iteration 553"
## [1] "Iteration 554"
## [1] "Iteration 555"
## [1] "Iteration 555: objective function value is 2.277860"
```



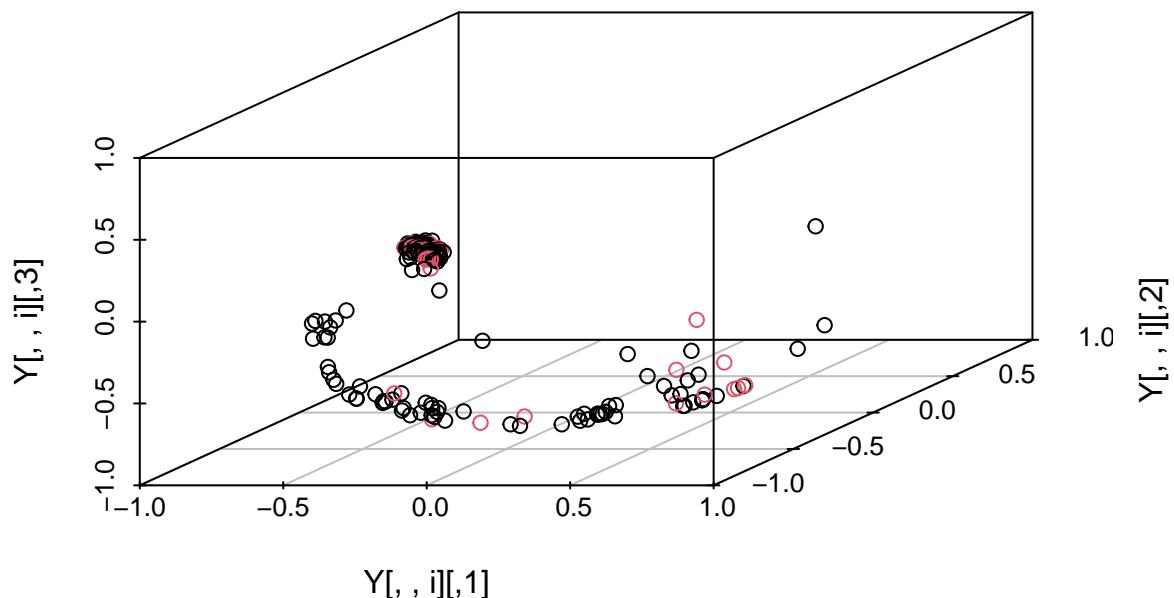
```
## [1] "Iteration 556"
## [1] "Iteration 557"
## [1] "Iteration 558"
## [1] "Iteration 559"
## [1] "Iteration 560"
## [1] "Iteration 560: objective function value is 2.253649"
```



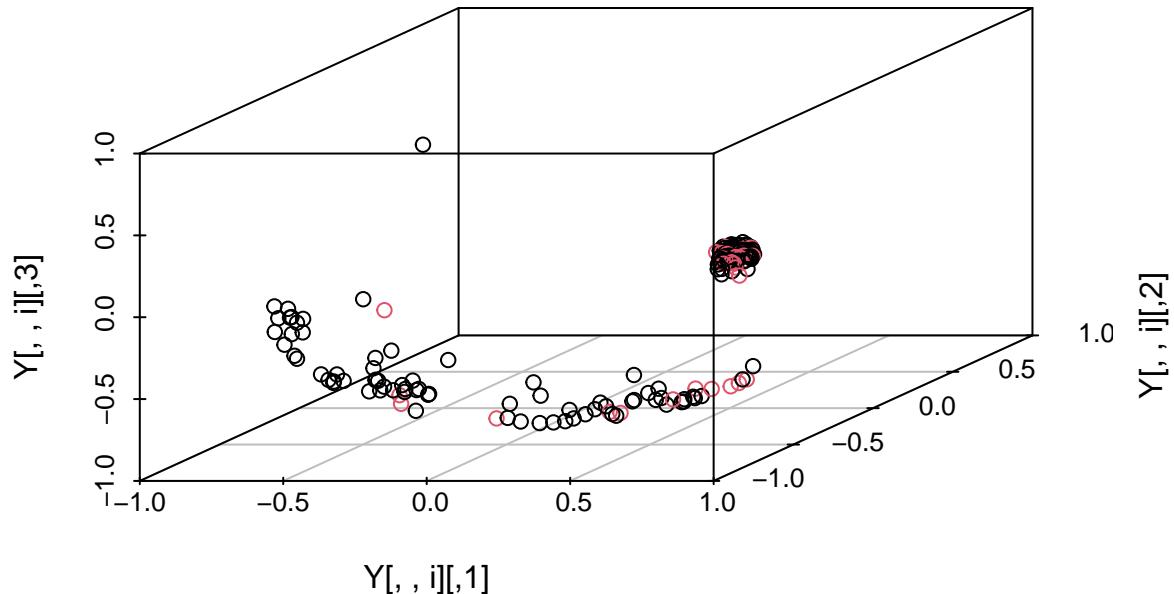
```
## [1] "Iteration 561"
## [1] "Iteration 562"
## [1] "Iteration 563"
## [1] "Iteration 564"
## [1] "Iteration 565"
## [1] "Iteration 565: objective function value is 2.286323"
```



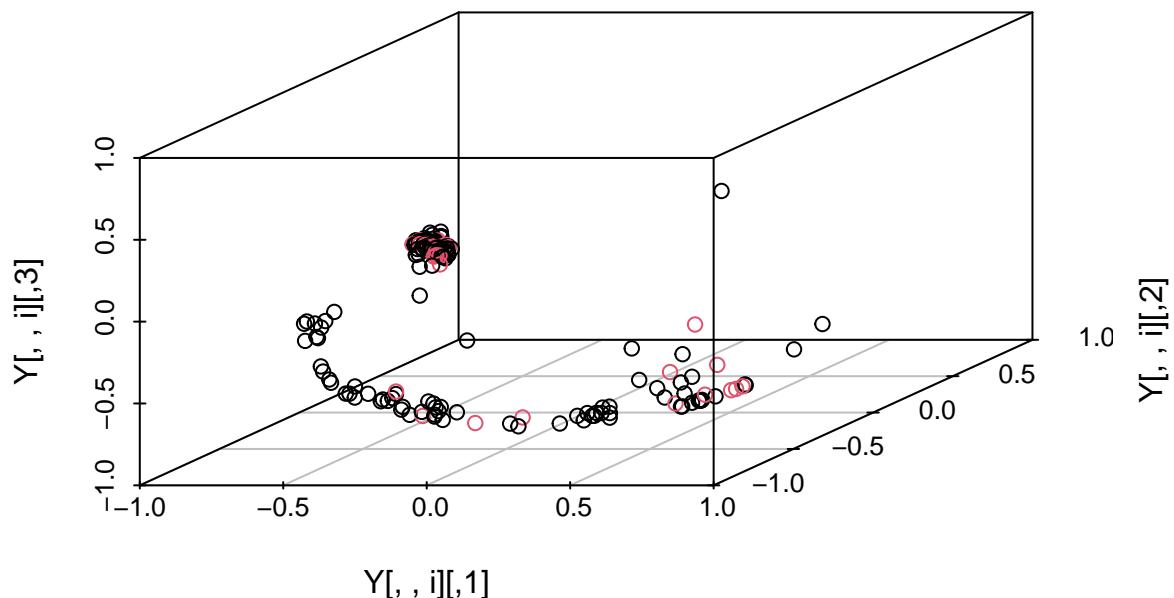
```
## [1] "Iteration 566"
## [1] "Iteration 567"
## [1] "Iteration 568"
## [1] "Iteration 569"
## [1] "Iteration 570"
## [1] "Iteration 570: objective function value is 2.254447"
```



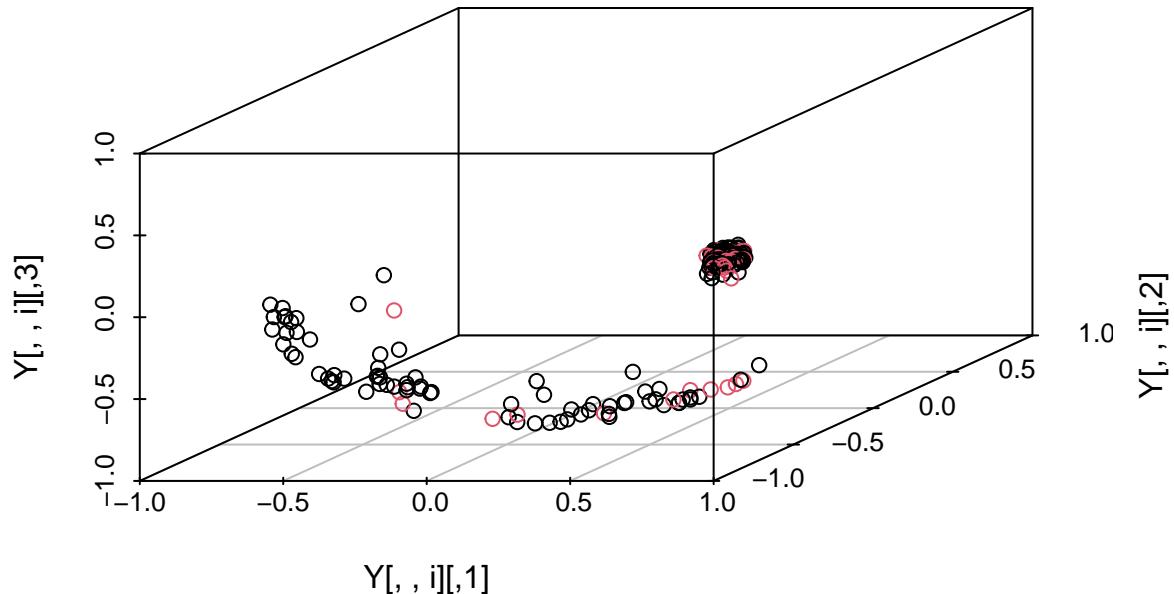
```
## [1] "Iteration 571"
## [1] "Iteration 572"
## [1] "Iteration 573"
## [1] "Iteration 574"
## [1] "Iteration 575"
## [1] "Iteration 575: objective function value is 2.277639"
```



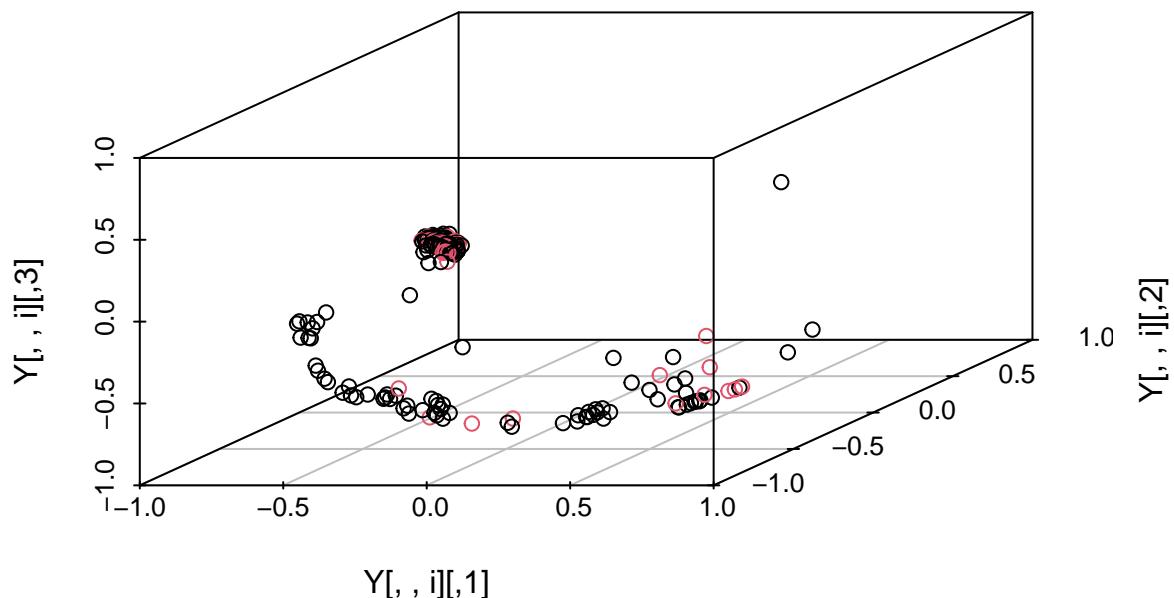
```
## [1] "Iteration 576"
## [1] "Iteration 577"
## [1] "Iteration 578"
## [1] "Iteration 579"
## [1] "Iteration 580"
## [1] "Iteration 580: objective function value is 2.257782"
```



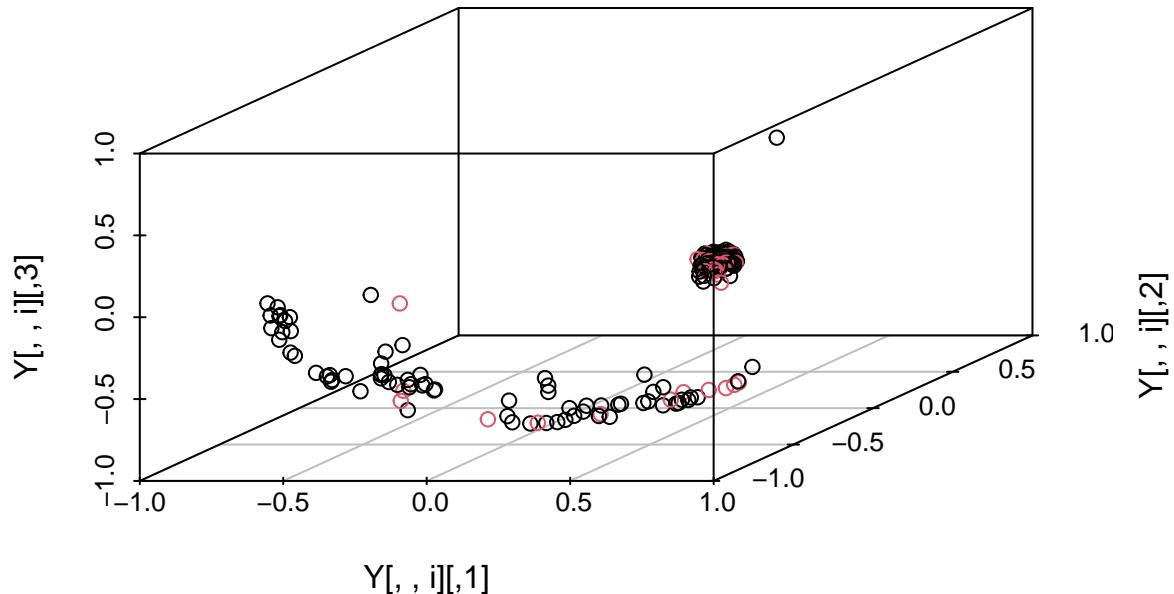
```
## [1] "Iteration 581"
## [1] "Iteration 582"
## [1] "Iteration 583"
## [1] "Iteration 584"
## [1] "Iteration 585"
## [1] "Iteration 585: objective function value is 2.297190"
```



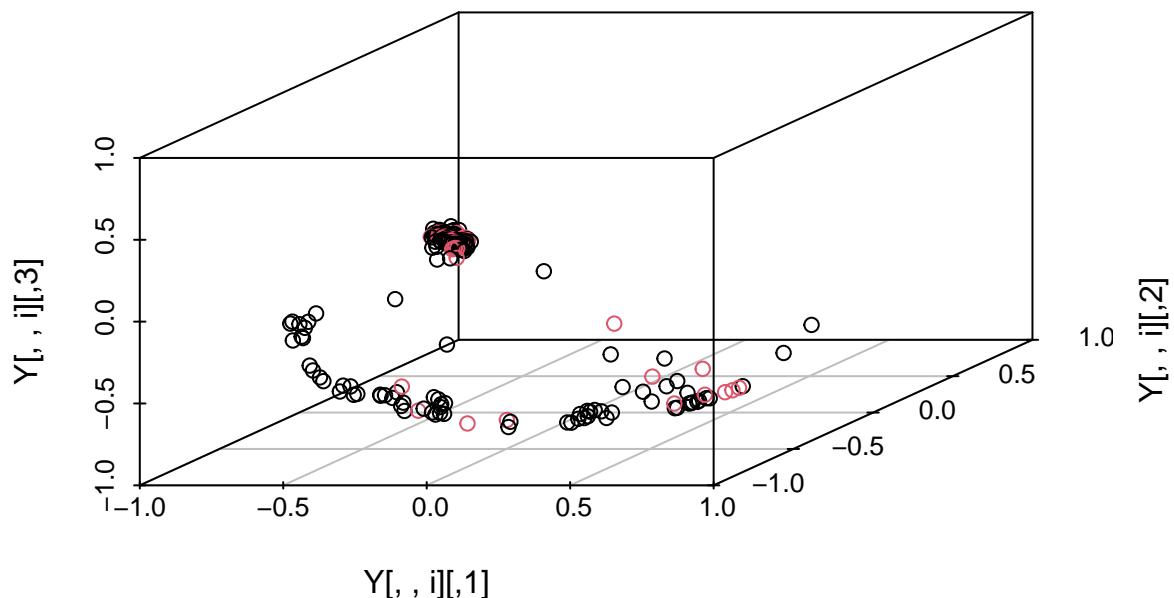
```
## [1] "Iteration 586"
## [1] "Iteration 587"
## [1] "Iteration 588"
## [1] "Iteration 589"
## [1] "Iteration 590"
## [1] "Iteration 590: objective function value is 2.254176"
```



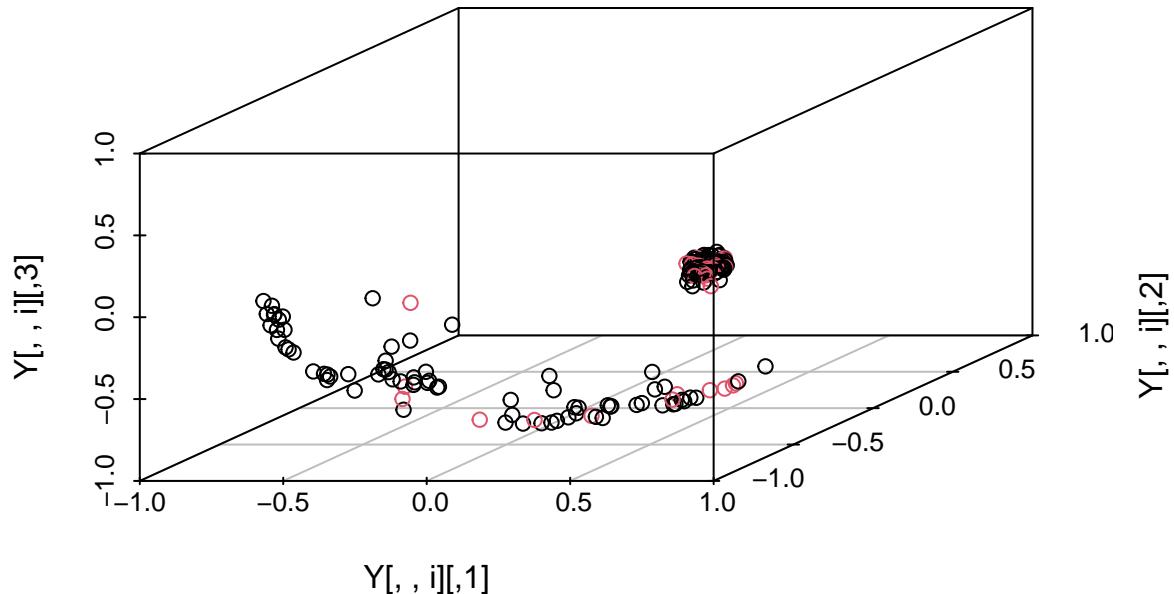
```
## [1] "Iteration 591"
## [1] "Iteration 592"
## [1] "Iteration 593"
## [1] "Iteration 594"
## [1] "Iteration 595"
## [1] "Iteration 595: objective function value is 2.288356"
```



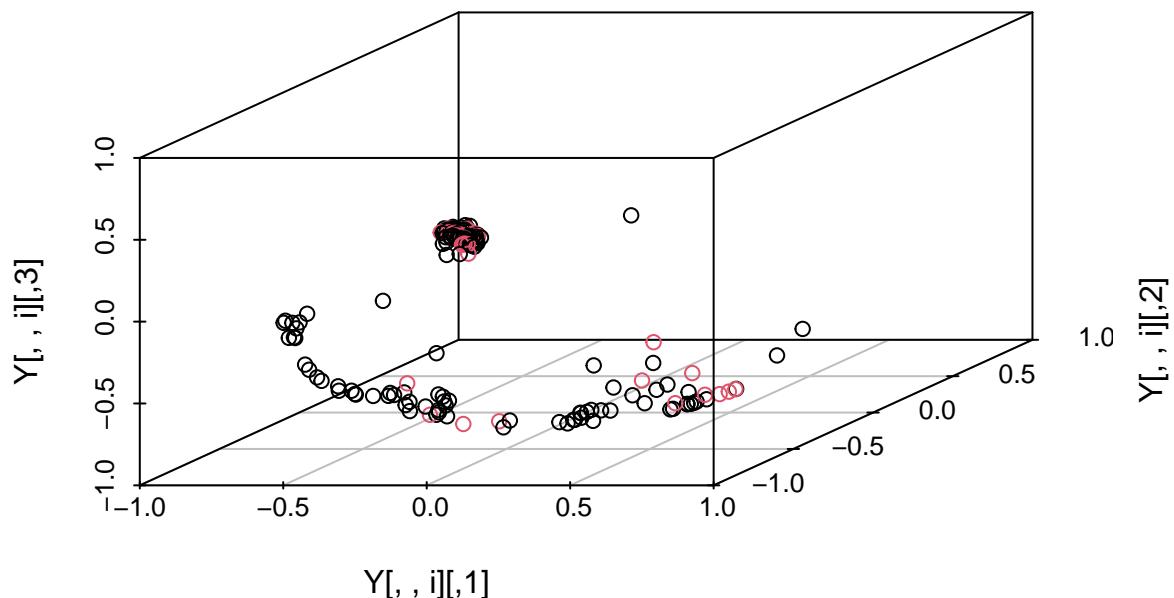
```
## [1] "Iteration 596"
## [1] "Iteration 597"
## [1] "Iteration 598"
## [1] "Iteration 599"
## [1] "Iteration 600"
## [1] "Iteration 600: objective function value is 2.248386"
```



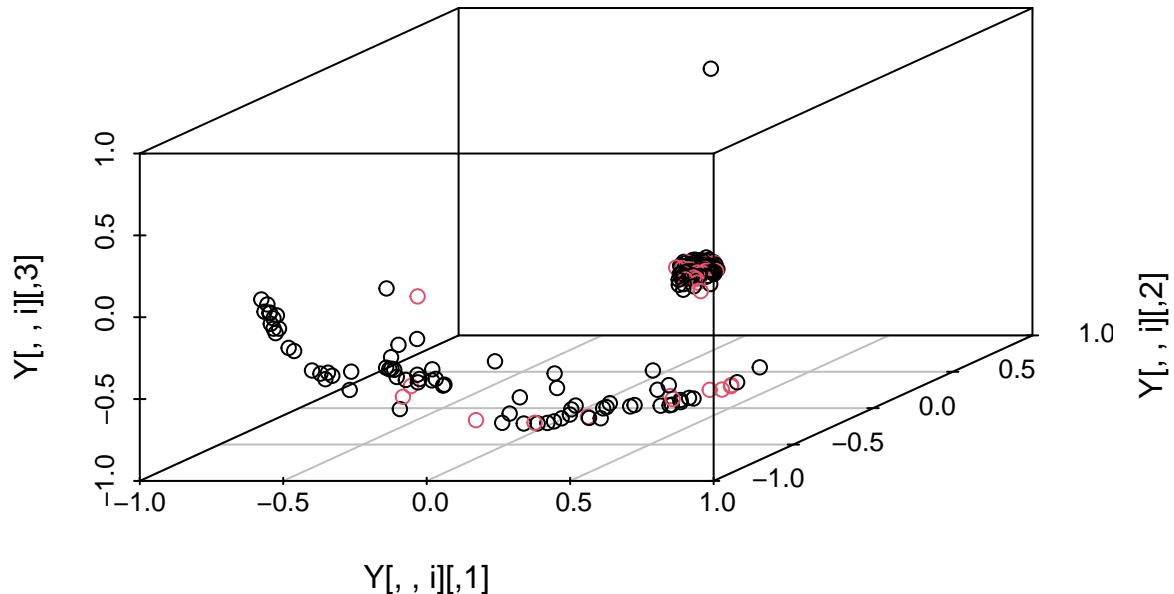
```
## [1] "Iteration 601"
## [1] "Iteration 602"
## [1] "Iteration 603"
## [1] "Iteration 604"
## [1] "Iteration 605"
## [1] "Iteration 605: objective function value is 2.290080"
```



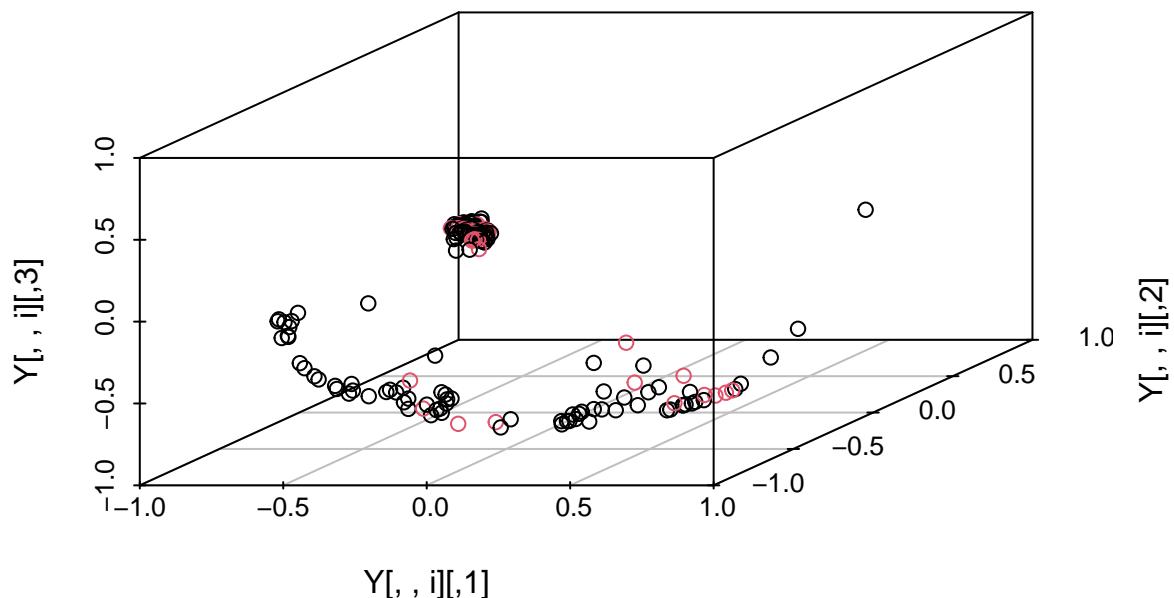
```
## [1] "Iteration 606"
## [1] "Iteration 607"
## [1] "Iteration 608"
## [1] "Iteration 609"
## [1] "Iteration 610"
## [1] "Iteration 610: objective function value is 2.249022"
```



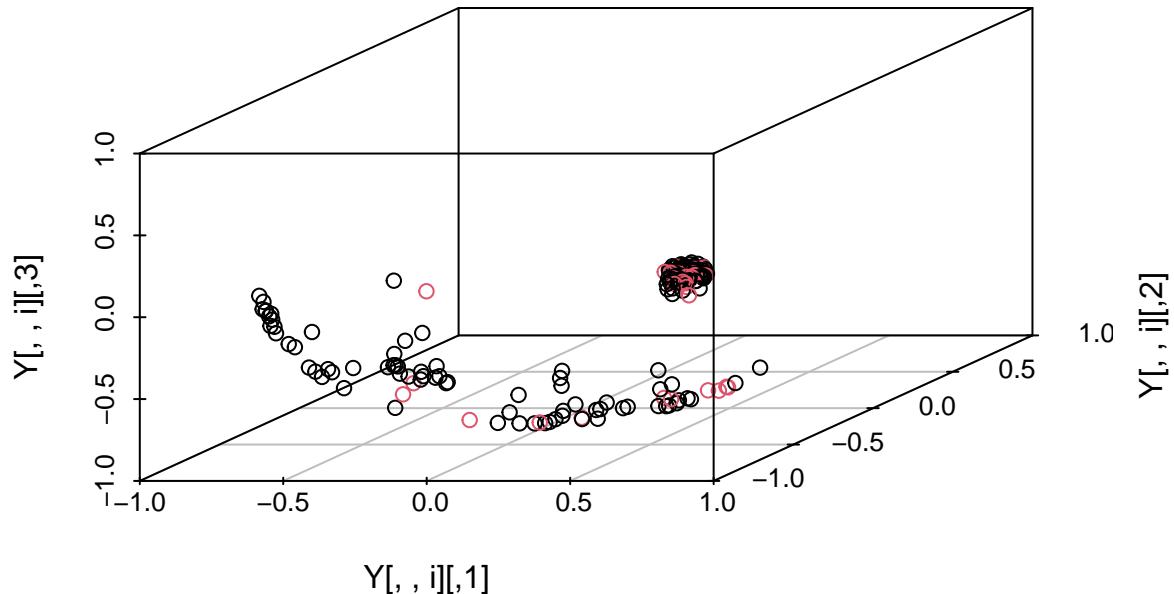
```
## [1] "Iteration 611"
## [1] "Iteration 612"
## [1] "Iteration 613"
## [1] "Iteration 614"
## [1] "Iteration 615"
## [1] "Iteration 615: objective function value is 2.290606"
```



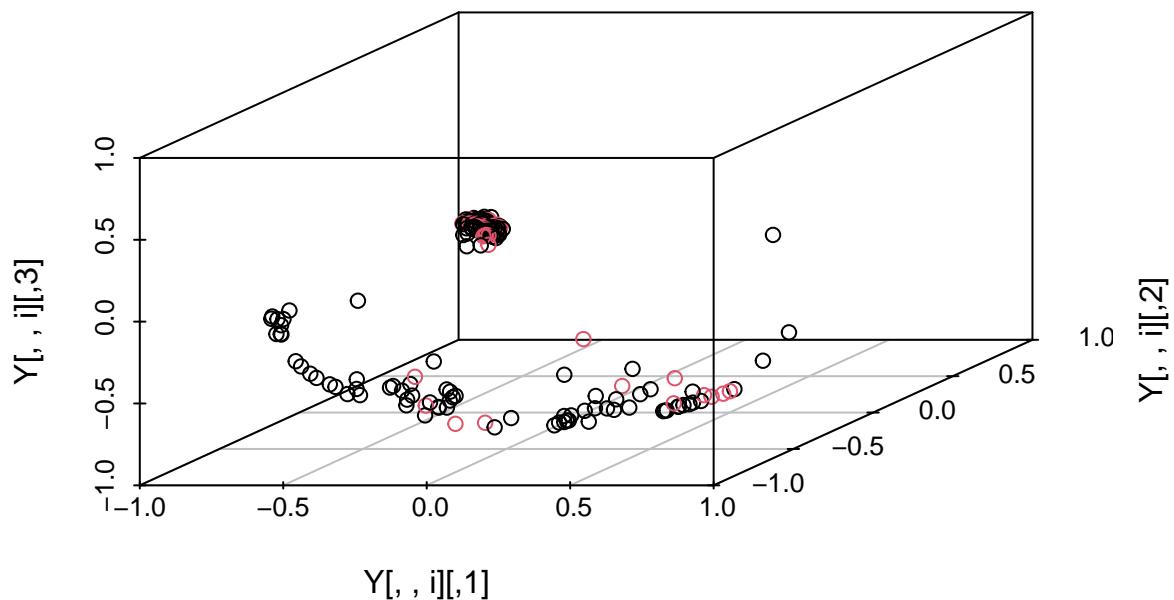
```
## [1] "Iteration 616"
## [1] "Iteration 617"
## [1] "Iteration 618"
## [1] "Iteration 619"
## [1] "Iteration 620"
## [1] "Iteration 620: objective function value is 2.249402"
```



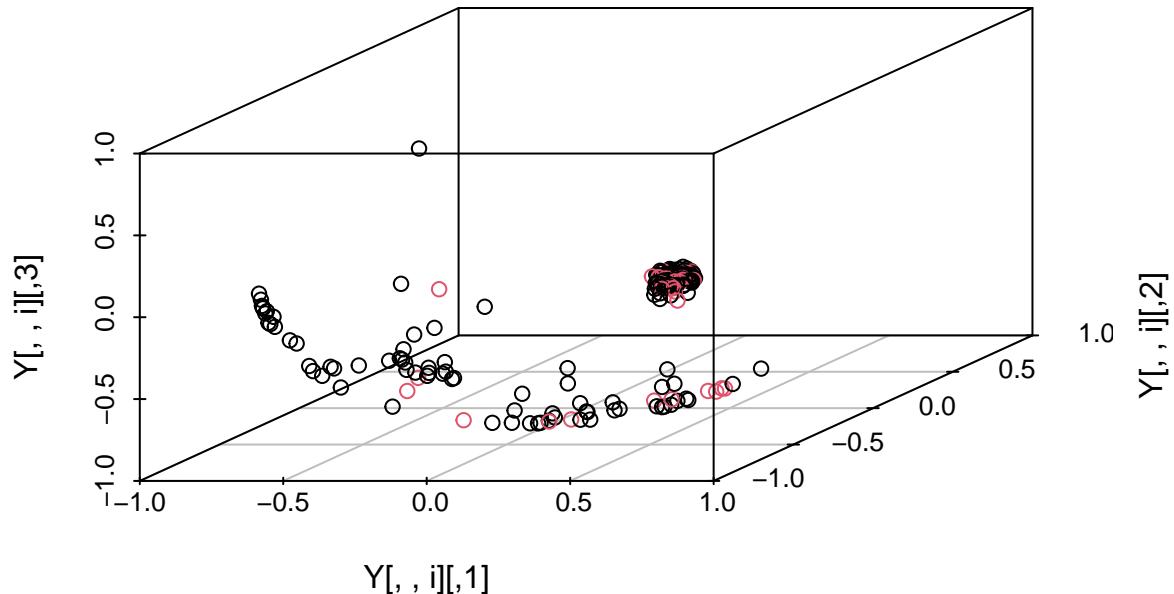
```
## [1] "Iteration 621"
## [1] "Iteration 622"
## [1] "Iteration 623"
## [1] "Iteration 624"
## [1] "Iteration 625"
## [1] "Iteration 625: objective function value is 2.290713"
```



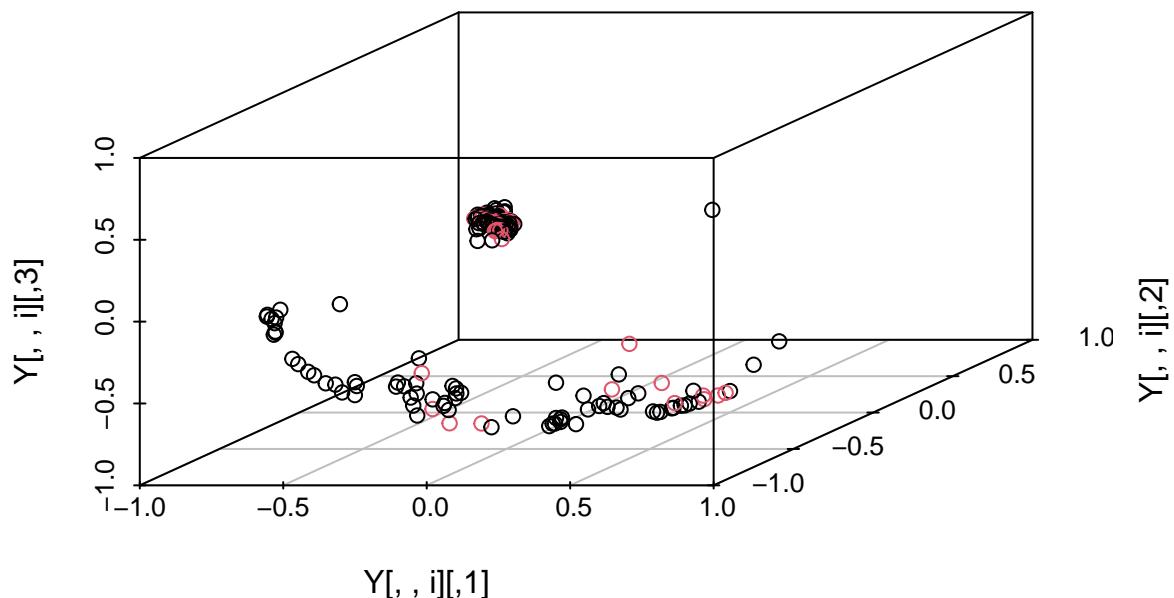
```
## [1] "Iteration 626"
## [1] "Iteration 627"
## [1] "Iteration 628"
## [1] "Iteration 629"
## [1] "Iteration 630"
## [1] "Iteration 630: objective function value is 2.243237"
```



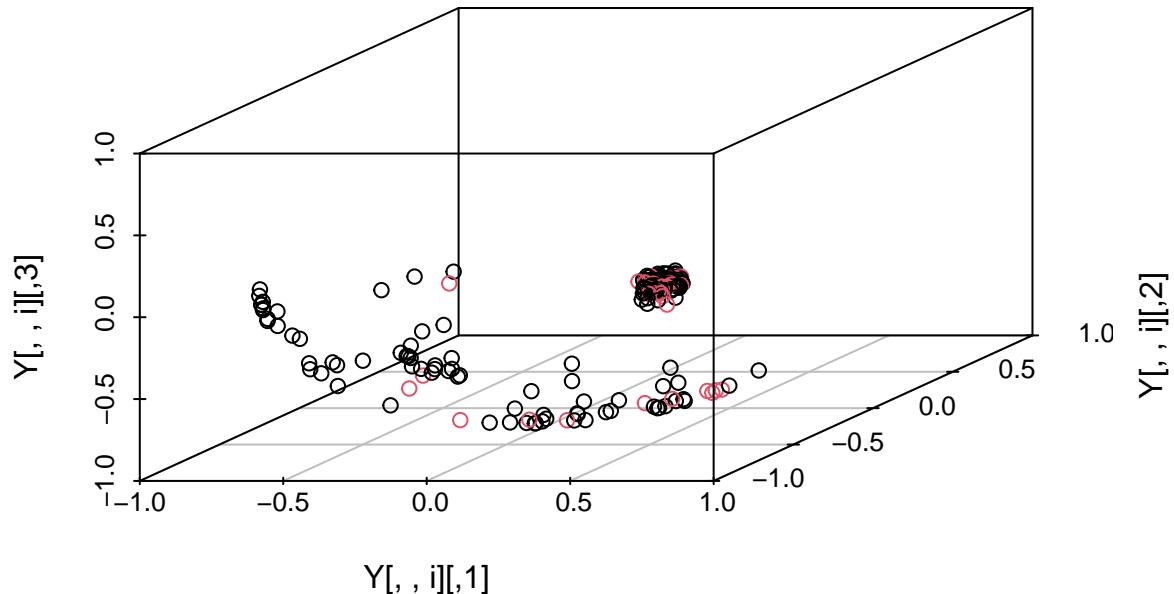
```
## [1] "Iteration 631"
## [1] "Iteration 632"
## [1] "Iteration 633"
## [1] "Iteration 634"
## [1] "Iteration 635"
## [1] "Iteration 635: objective function value is 2.292418"
```



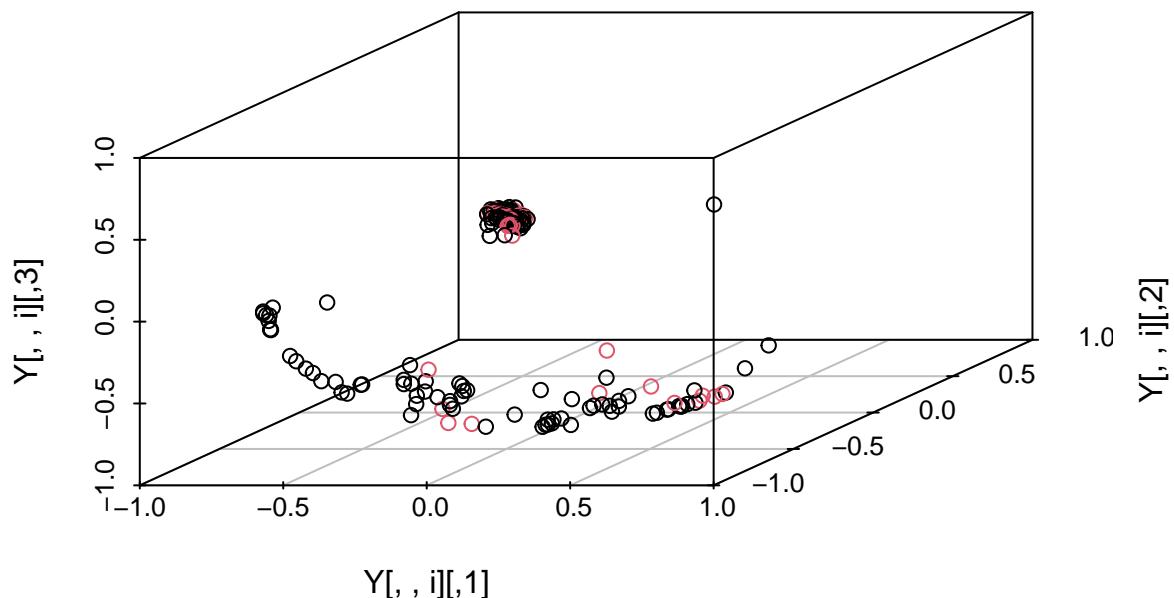
```
## [1] "Iteration 636"
## [1] "Iteration 637"
## [1] "Iteration 638"
## [1] "Iteration 639"
## [1] "Iteration 640"
## [1] "Iteration 640: objective function value is 2.239509"
```



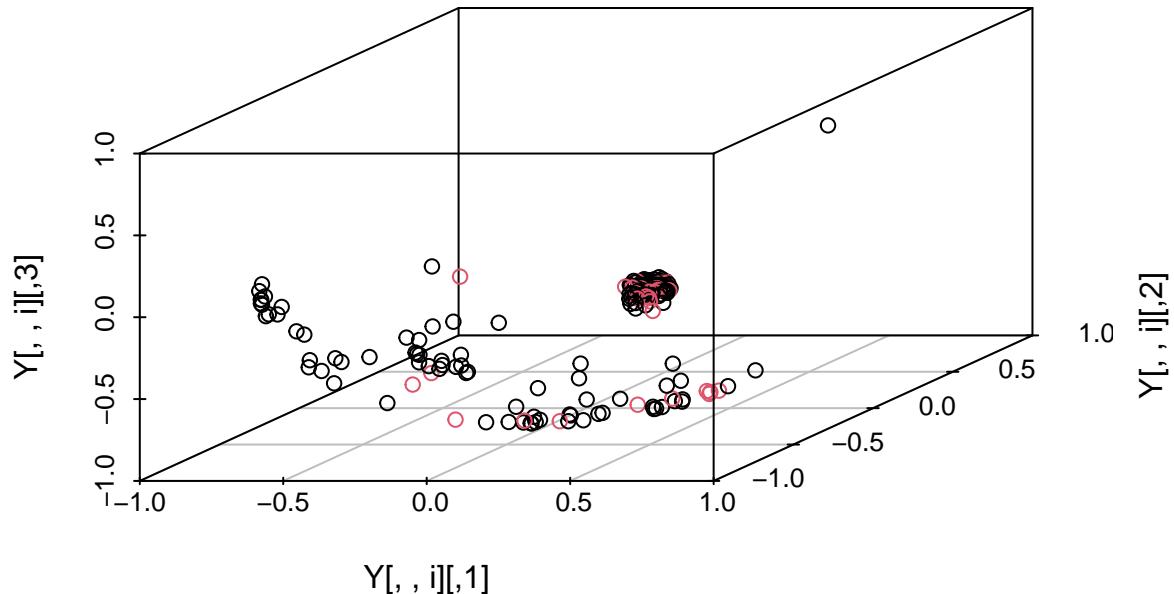
```
## [1] "Iteration 641"
## [1] "Iteration 642"
## [1] "Iteration 643"
## [1] "Iteration 644"
## [1] "Iteration 645"
## [1] "Iteration 645: objective function value is 2.307778"
```



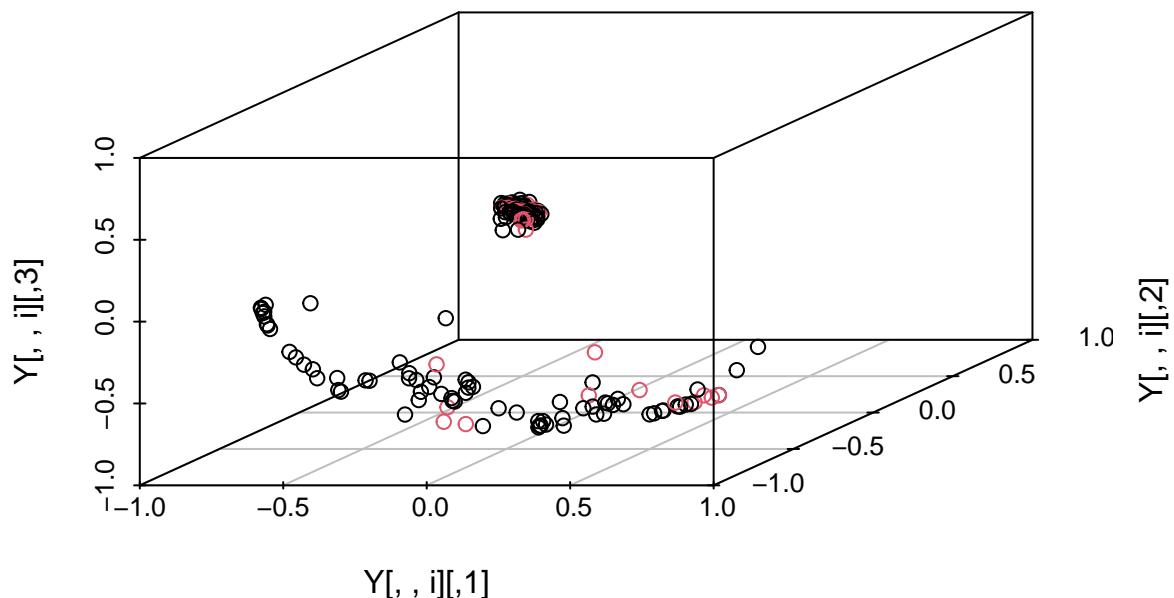
```
## [1] "Iteration 646"
## [1] "Iteration 647"
## [1] "Iteration 648"
## [1] "Iteration 649"
## [1] "Iteration 650"
## [1] "Iteration 650: objective function value is 2.240203"
```



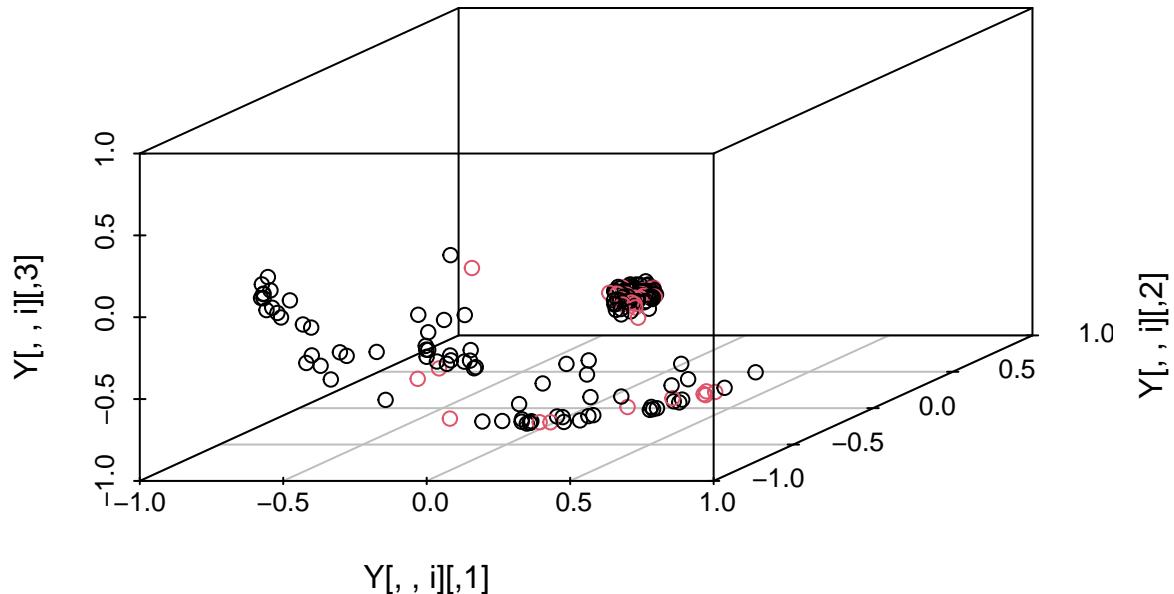
```
## [1] "Iteration 651"
## [1] "Iteration 652"
## [1] "Iteration 653"
## [1] "Iteration 654"
## [1] "Iteration 655"
## [1] "Iteration 655: objective function value is 2.306692"
```



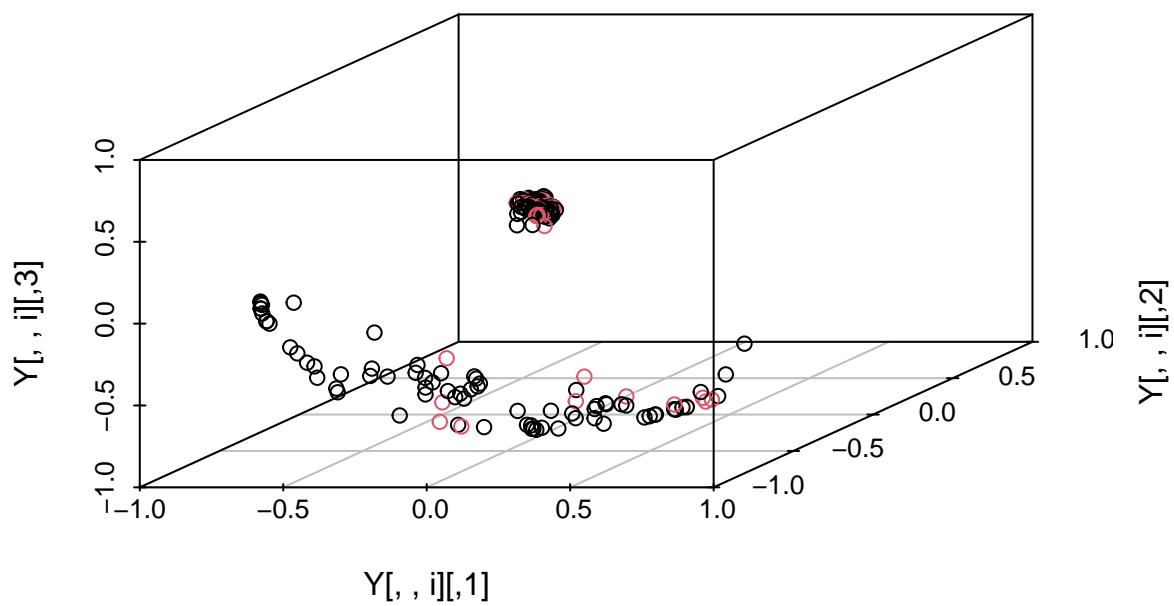
```
## [1] "Iteration 656"
## [1] "Iteration 657"
## [1] "Iteration 658"
## [1] "Iteration 659"
## [1] "Iteration 660"
## [1] "Iteration 660: objective function value is 2.224239"
```



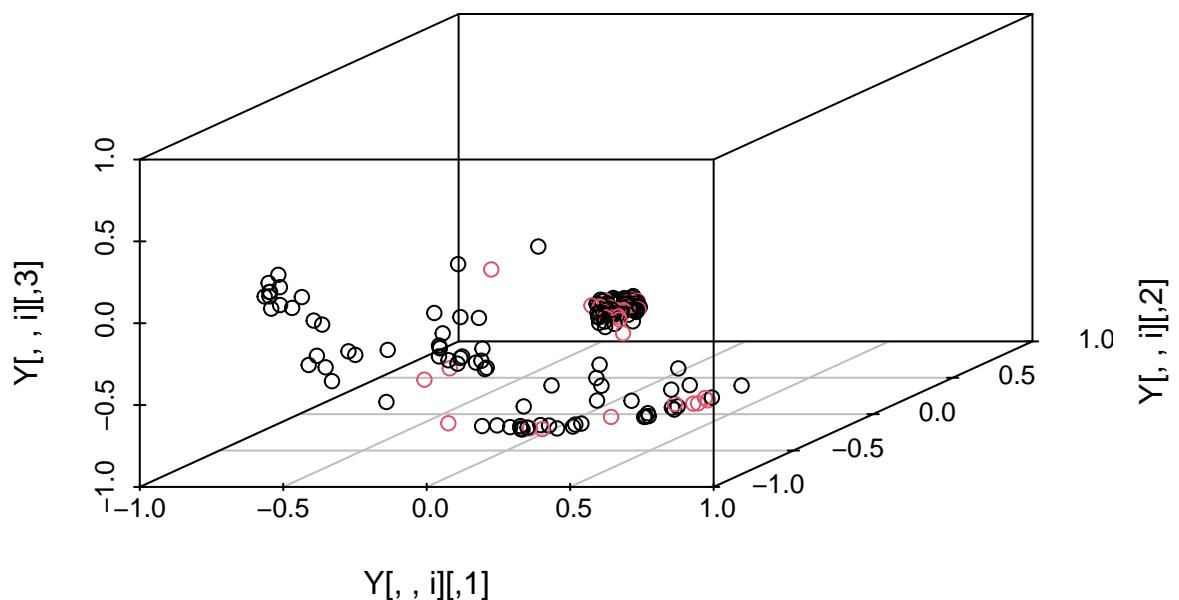
```
## [1] "Iteration 661"
## [1] "Iteration 662"
## [1] "Iteration 663"
## [1] "Iteration 664"
## [1] "Iteration 665"
## [1] "Iteration 665: objective function value is 2.300872"
```



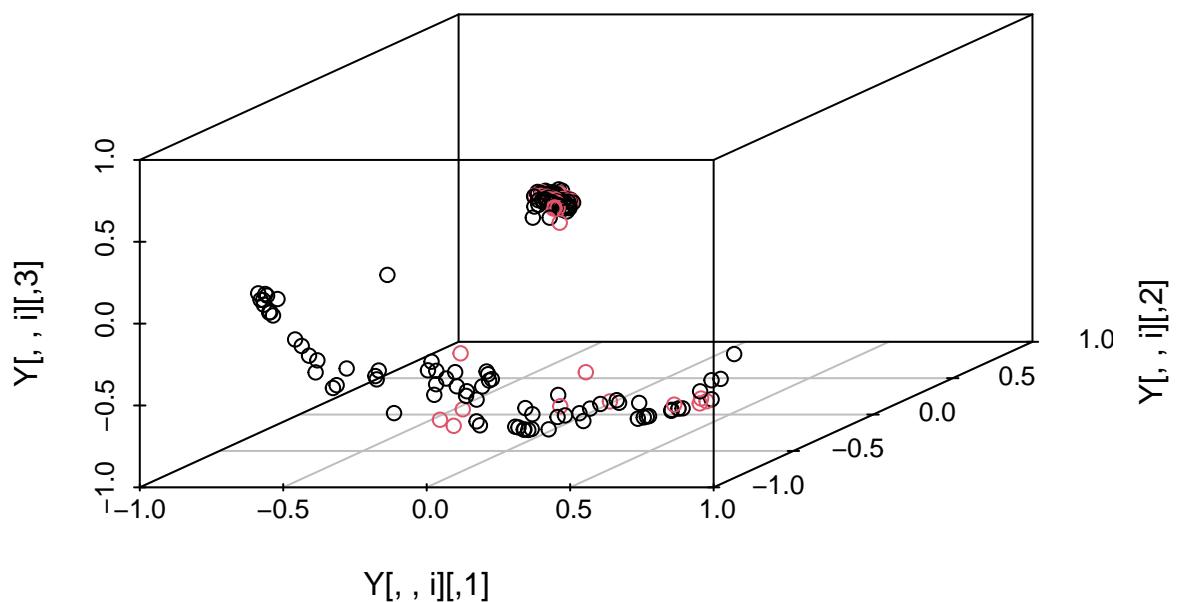
```
## [1] "Iteration 666"
## [1] "Iteration 667"
## [1] "Iteration 668"
## [1] "Iteration 669"
## [1] "Iteration 670"
## [1] "Iteration 670: objective function value is 2.209823"
```



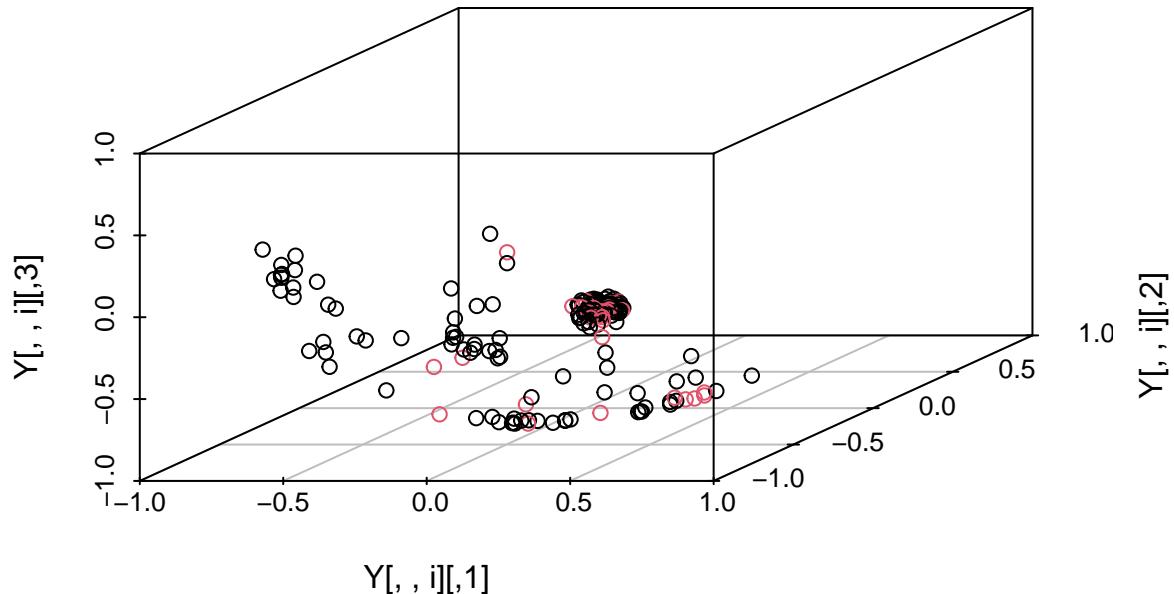
```
## [1] "Iteration 671"
## [1] "Iteration 672"
## [1] "Iteration 673"
## [1] "Iteration 674"
## [1] "Iteration 675"
## [1] "Iteration 675: objective function value is 2.312534"
```



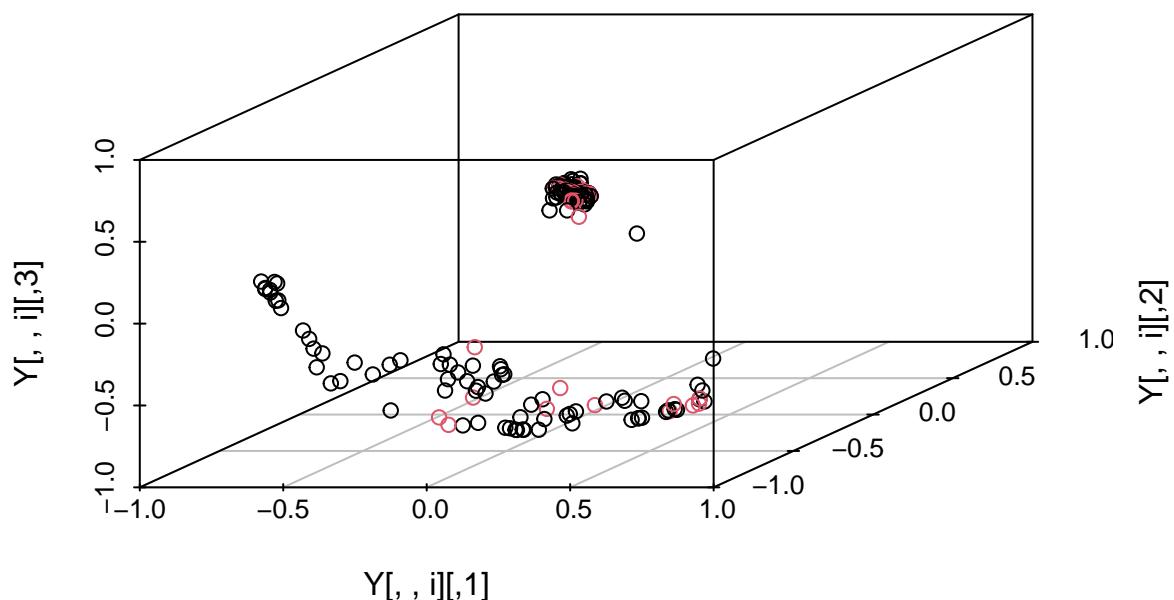
```
## [1] "Iteration 676"
## [1] "Iteration 677"
## [1] "Iteration 678"
## [1] "Iteration 679"
## [1] "Iteration 680"
## [1] "Iteration 680: objective function value is 2.219897"
```



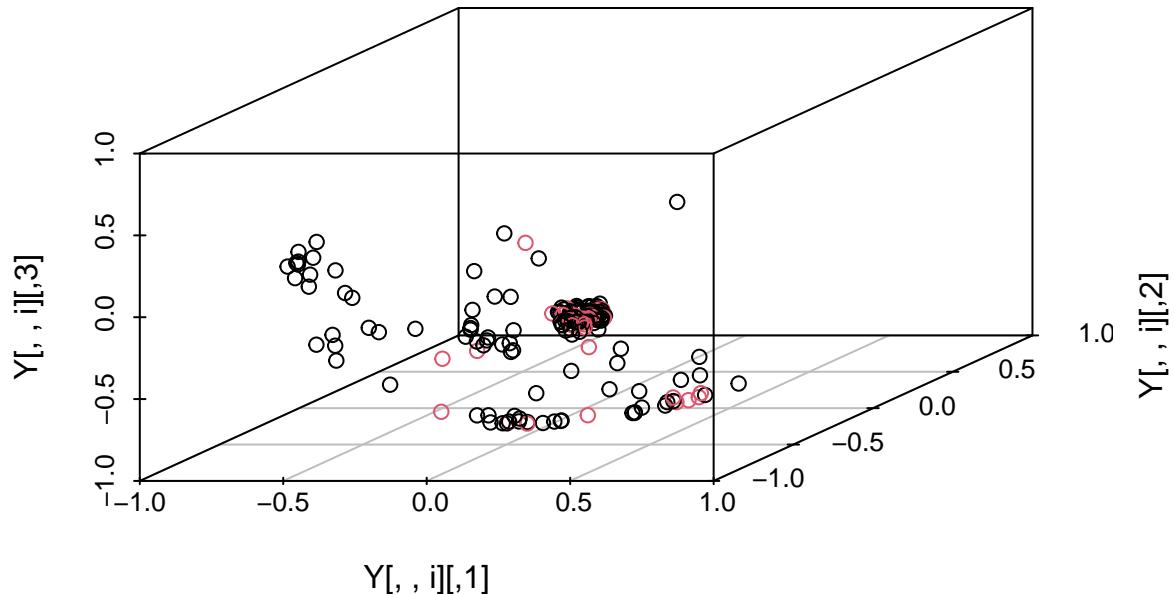
```
## [1] "Iteration 681"
## [1] "Iteration 682"
## [1] "Iteration 683"
## [1] "Iteration 684"
## [1] "Iteration 685"
## [1] "Iteration 685: objective function value is 2.320378"
```



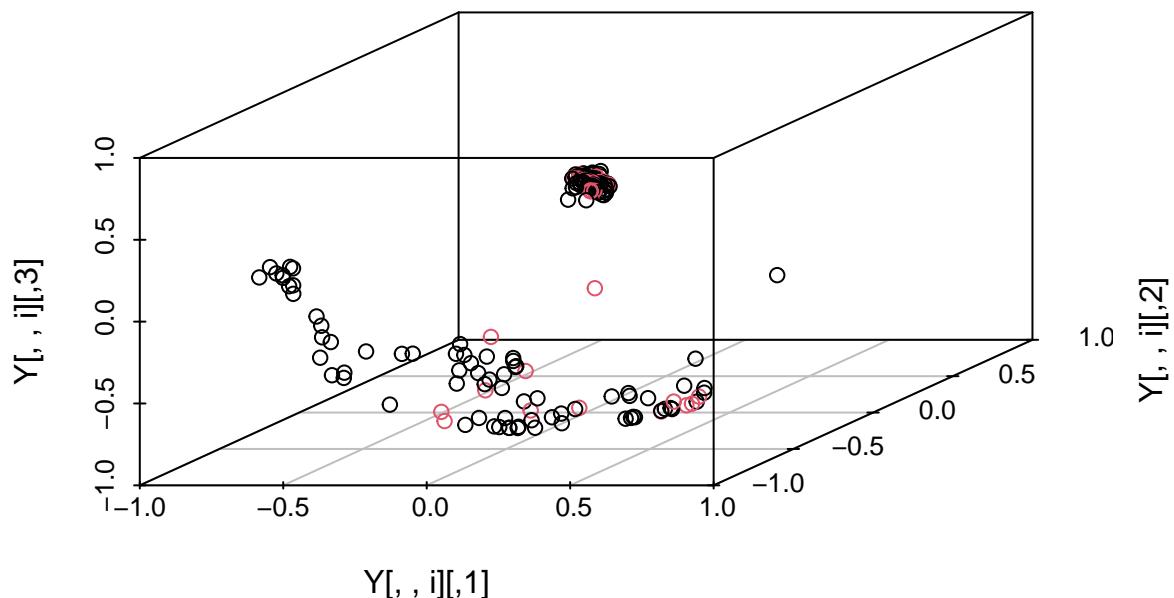
```
## [1] "Iteration 686"
## [1] "Iteration 687"
## [1] "Iteration 688"
## [1] "Iteration 689"
## [1] "Iteration 690"
## [1] "Iteration 690: objective function value is 2.208479"
```



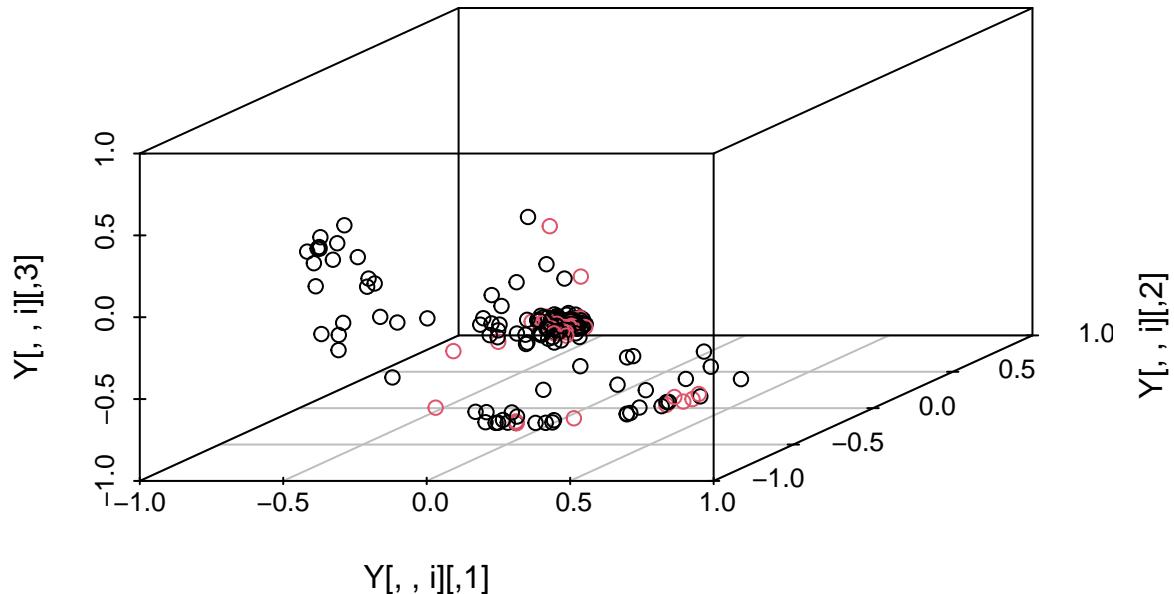
```
## [1] "Iteration 691"
## [1] "Iteration 692"
## [1] "Iteration 693"
## [1] "Iteration 694"
## [1] "Iteration 695"
## [1] "Iteration 695: objective function value is 2.328675"
```



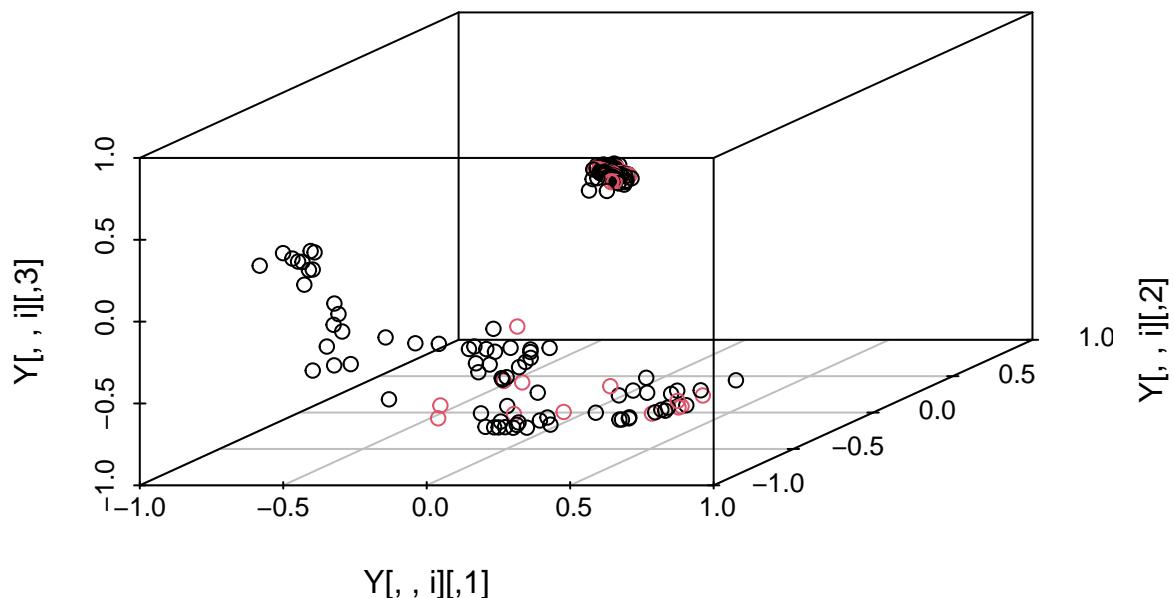
```
## [1] "Iteration 696"
## [1] "Iteration 697"
## [1] "Iteration 698"
## [1] "Iteration 699"
## [1] "Iteration 700"
## [1] "Iteration 700: objective function value is 2.196178"
```



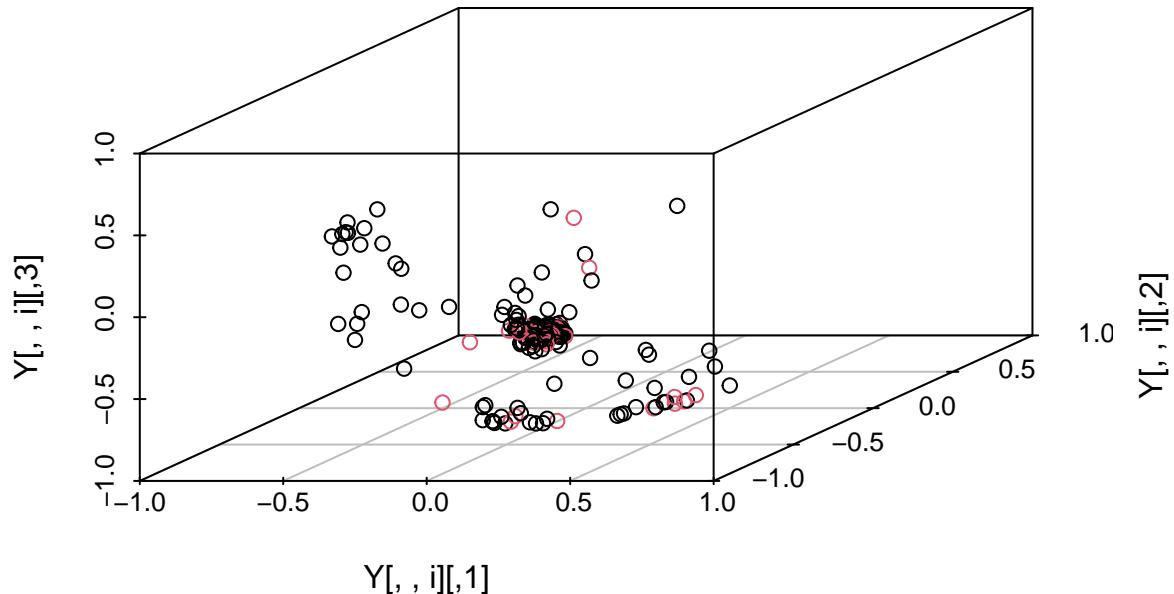
```
## [1] "Iteration 701"
## [1] "Iteration 702"
## [1] "Iteration 703"
## [1] "Iteration 704"
## [1] "Iteration 705"
## [1] "Iteration 705: objective function value is 2.335860"
```



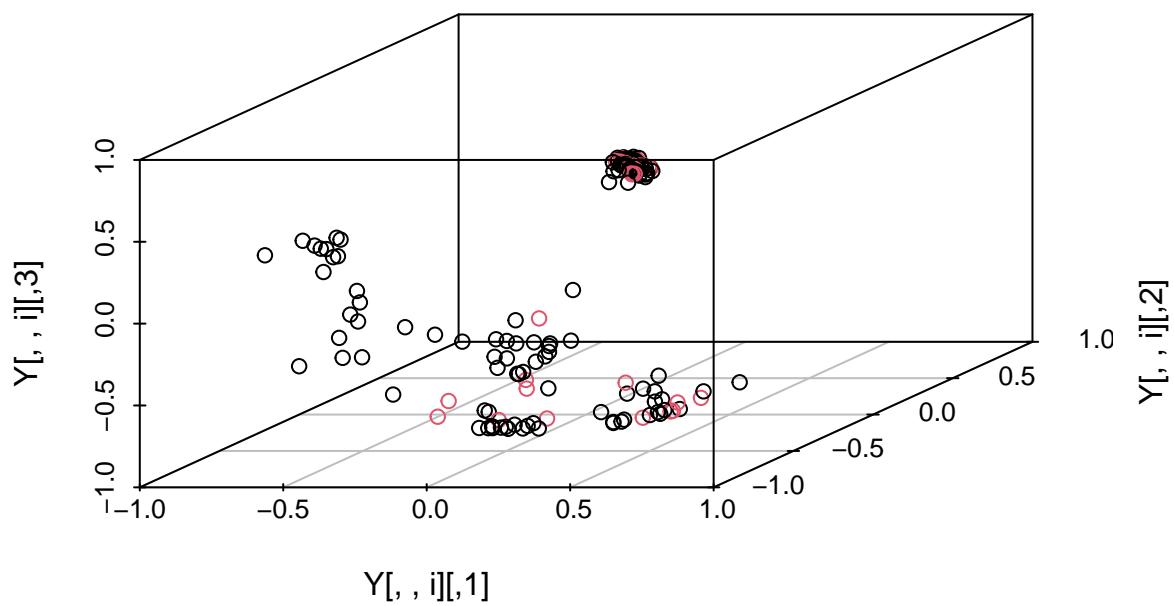
```
## [1] "Iteration 706"
## [1] "Iteration 707"
## [1] "Iteration 708"
## [1] "Iteration 709"
## [1] "Iteration 710"
## [1] "Iteration 710: objective function value is 2.169237"
```



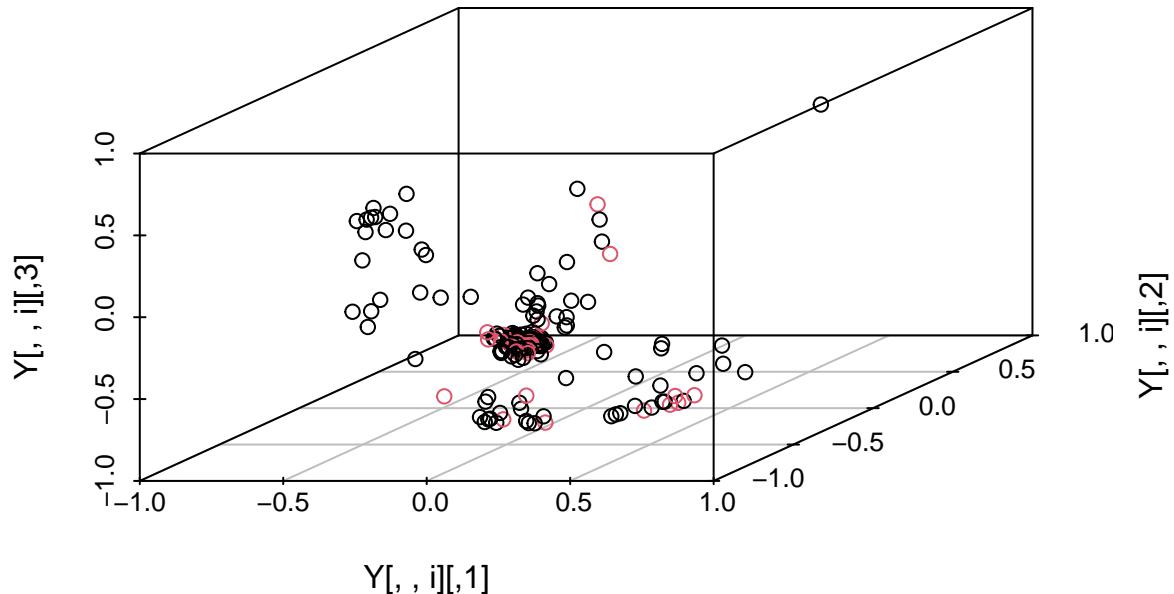
```
## [1] "Iteration 711"
## [1] "Iteration 712"
## [1] "Iteration 713"
## [1] "Iteration 714"
## [1] "Iteration 715"
## [1] "Iteration 715: objective function value is 2.344307"
```



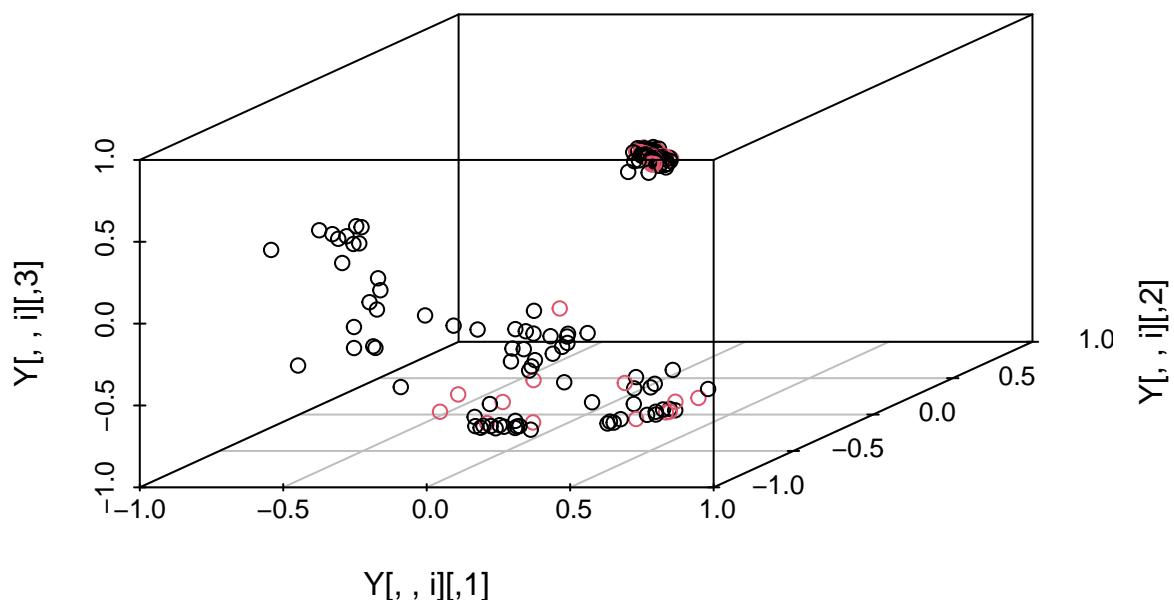
```
## [1] "Iteration 716"
## [1] "Iteration 717"
## [1] "Iteration 718"
## [1] "Iteration 719"
## [1] "Iteration 720"
## [1] "Iteration 720: objective function value is 2.164873"
```



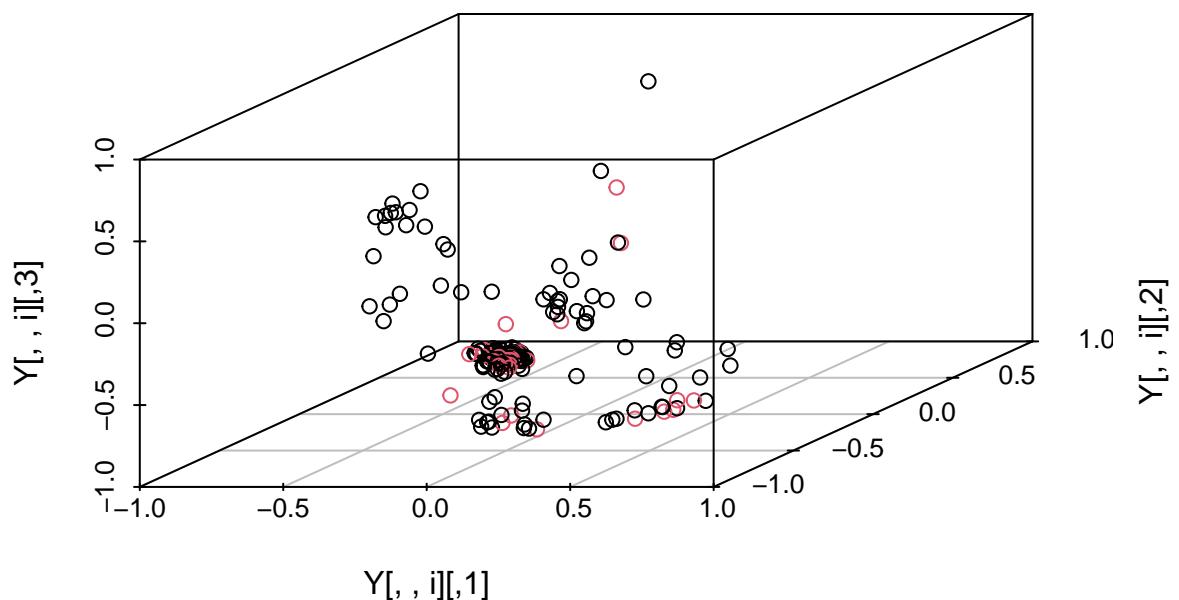
```
## [1] "Iteration 721"
## [1] "Iteration 722"
## [1] "Iteration 723"
## [1] "Iteration 724"
## [1] "Iteration 725"
## [1] "Iteration 725: objective function value is 2.351293"
```



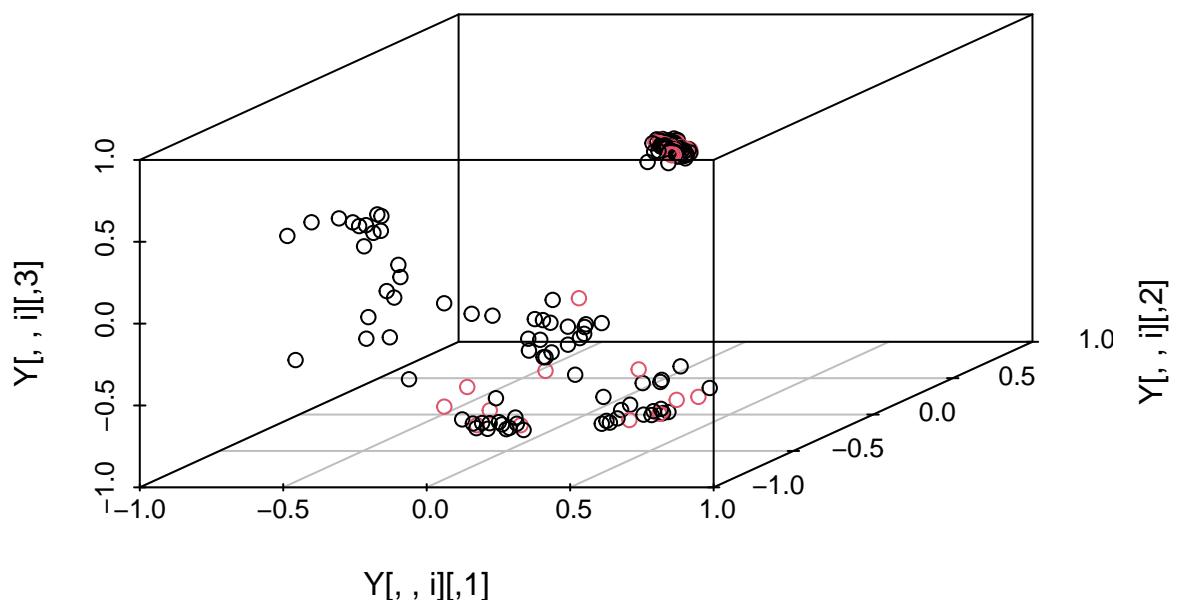
```
## [1] "Iteration 726"
## [1] "Iteration 727"
## [1] "Iteration 728"
## [1] "Iteration 729"
## [1] "Iteration 730"
## [1] "Iteration 730: objective function value is 2.168502"
```



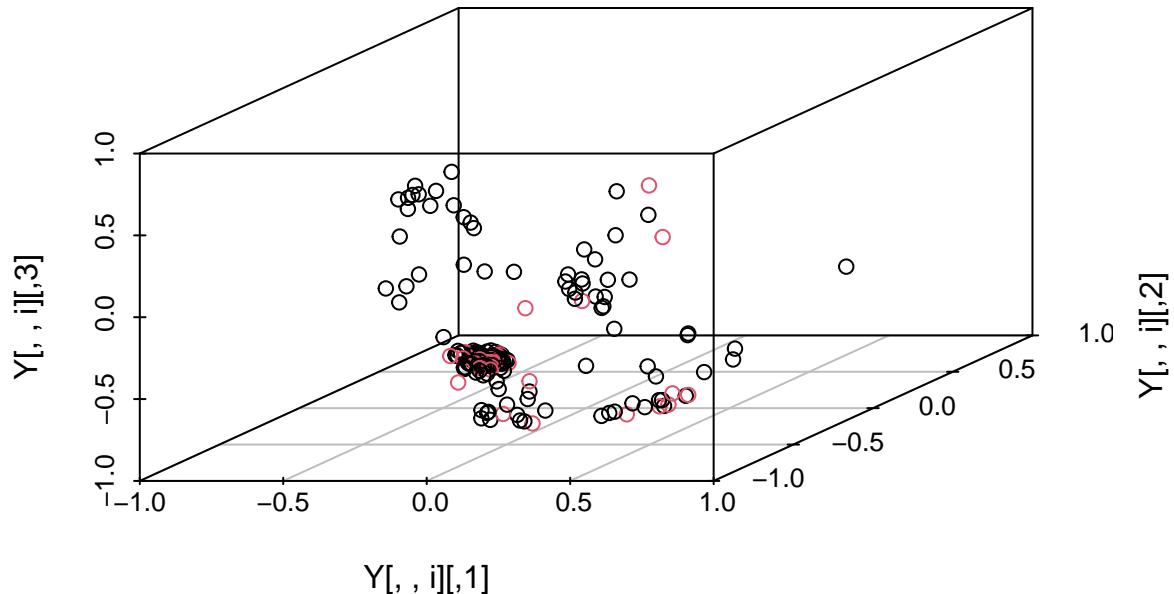
```
## [1] "Iteration 731"
## [1] "Iteration 732"
## [1] "Iteration 733"
## [1] "Iteration 734"
## [1] "Iteration 735"
## [1] "Iteration 735: objective function value is 2.342538"
```



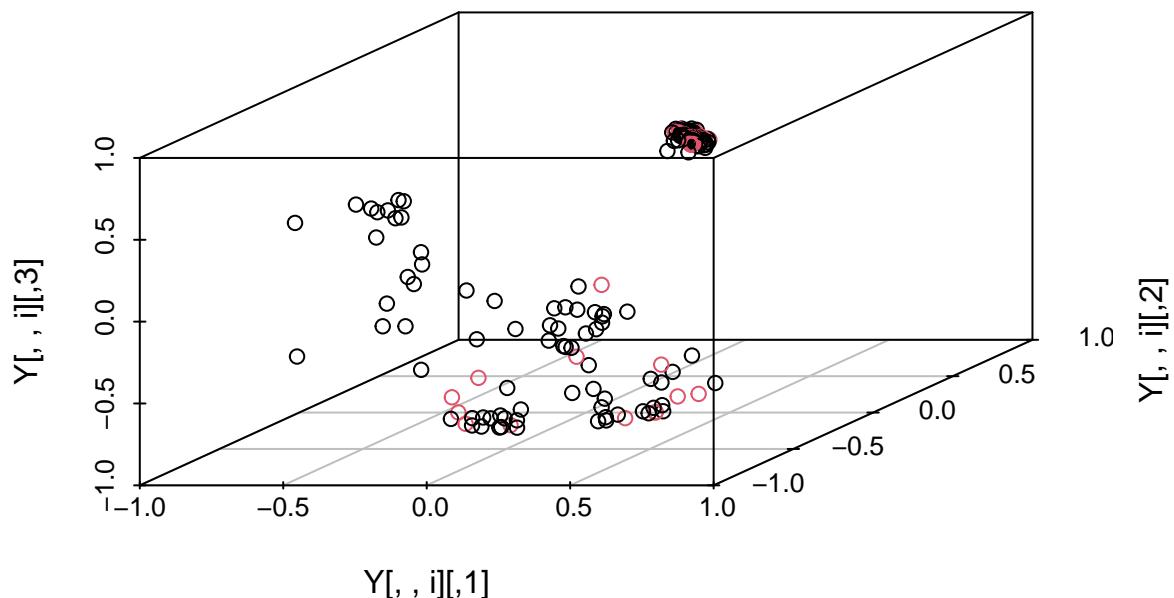
```
## [1] "Iteration 736"
## [1] "Iteration 737"
## [1] "Iteration 738"
## [1] "Iteration 739"
## [1] "Iteration 740"
## [1] "Iteration 740: objective function value is 2.144722"
```



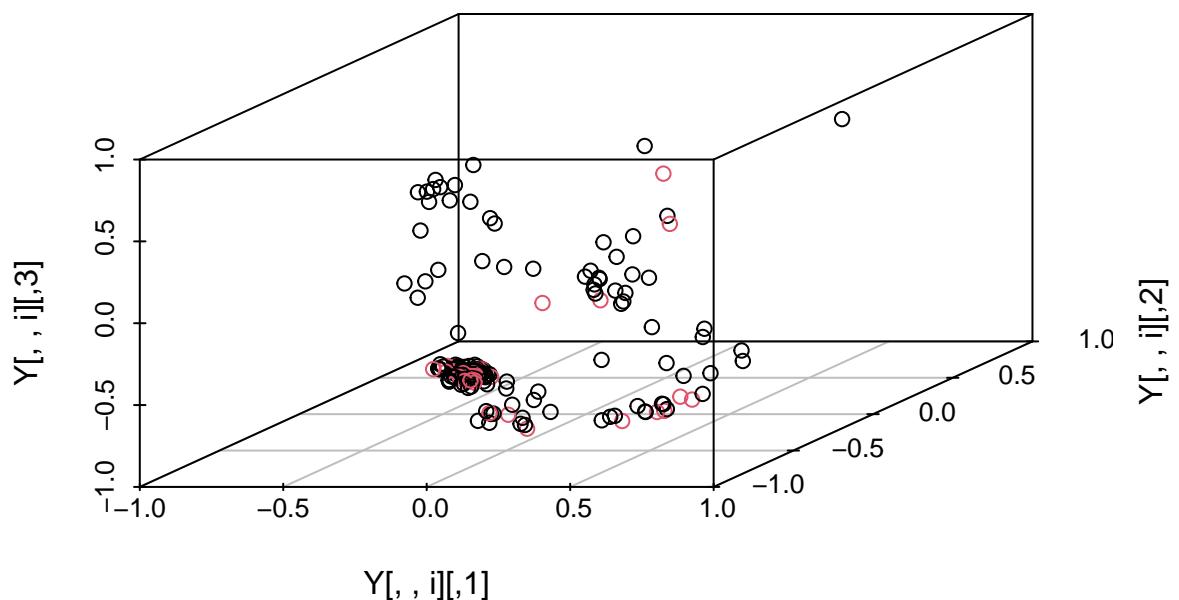
```
## [1] "Iteration 741"
## [1] "Iteration 742"
## [1] "Iteration 743"
## [1] "Iteration 744"
## [1] "Iteration 745"
## [1] "Iteration 745: objective function value is 2.340397"
```



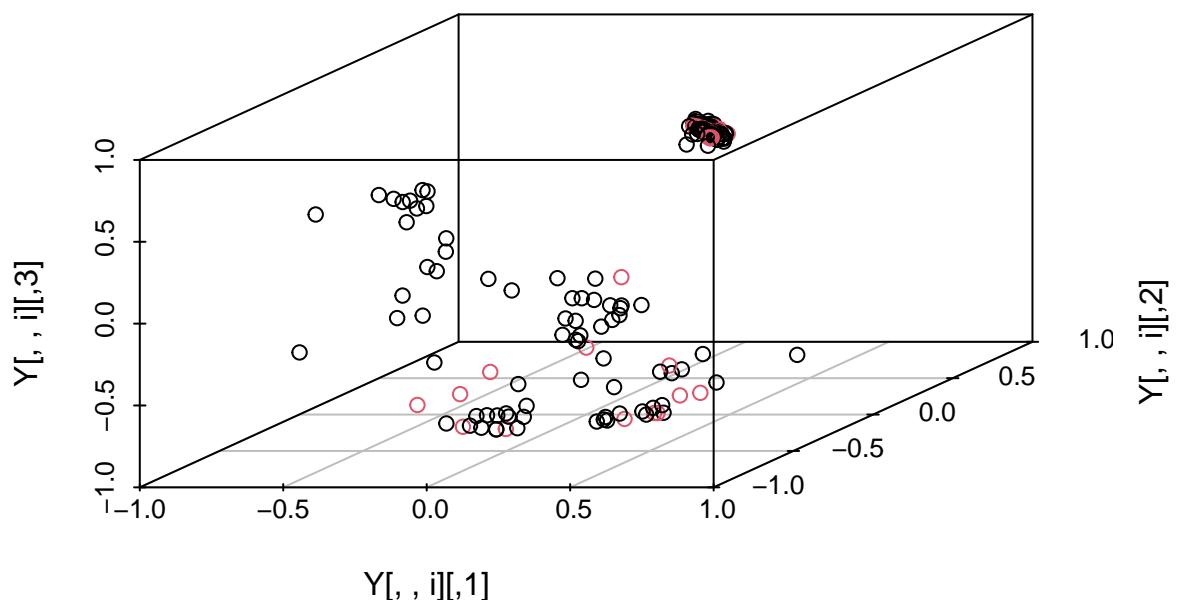
```
## [1] "Iteration 746"
## [1] "Iteration 747"
## [1] "Iteration 748"
## [1] "Iteration 749"
## [1] "Iteration 750"
## [1] "Iteration 750: objective function value is 2.163256"
```



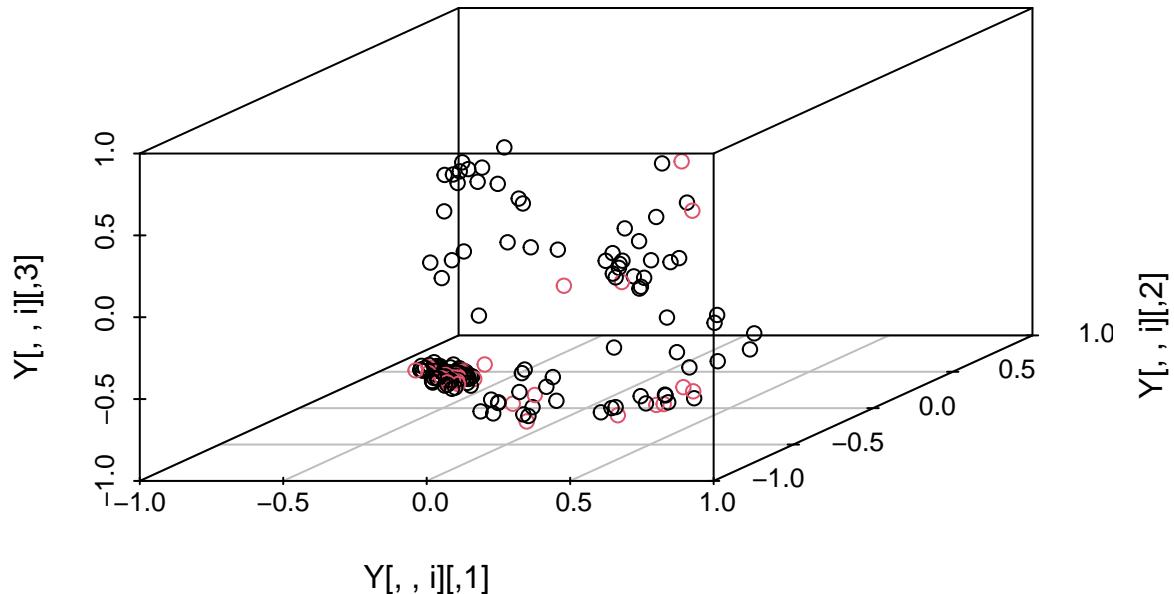
```
## [1] "Iteration 751"
## [1] "Iteration 752"
## [1] "Iteration 753"
## [1] "Iteration 754"
## [1] "Iteration 755"
## [1] "Iteration 755: objective function value is 2.340299"
```



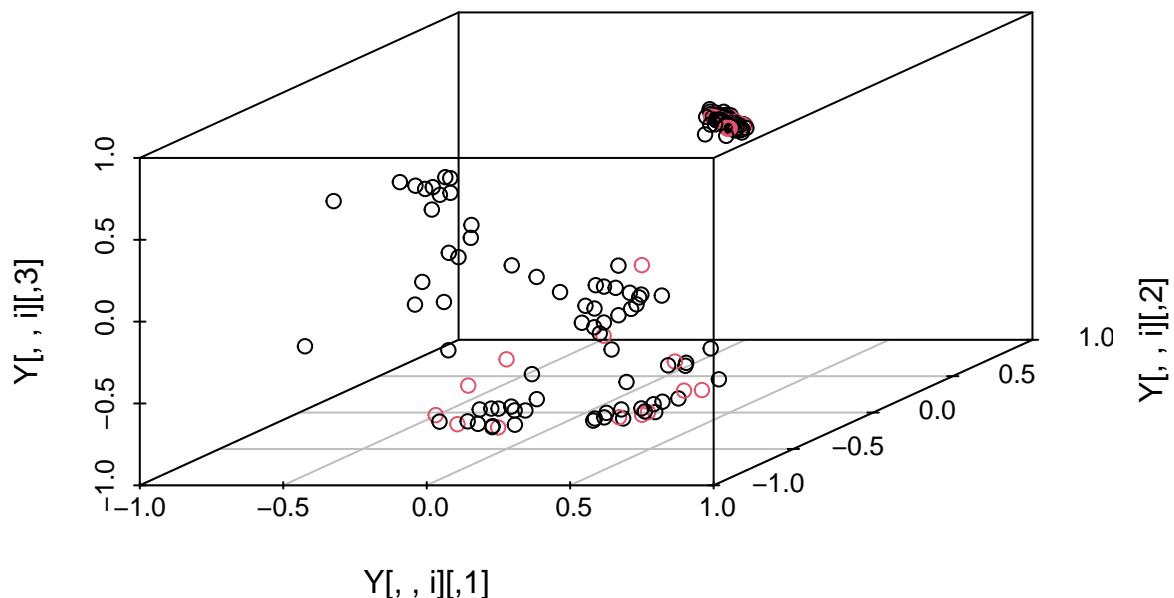
```
## [1] "Iteration 756"
## [1] "Iteration 757"
## [1] "Iteration 758"
## [1] "Iteration 759"
## [1] "Iteration 760"
## [1] "Iteration 760: objective function value is 2.144181"
```



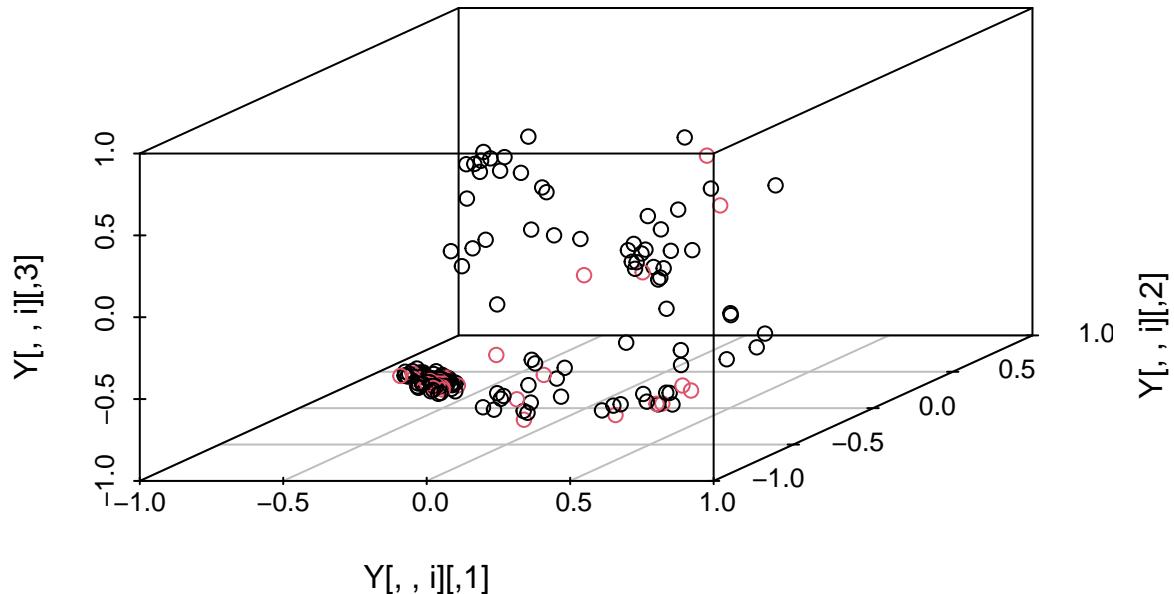
```
## [1] "Iteration 761"
## [1] "Iteration 762"
## [1] "Iteration 763"
## [1] "Iteration 764"
## [1] "Iteration 765"
## [1] "Iteration 765: objective function value is 2.325008"
```



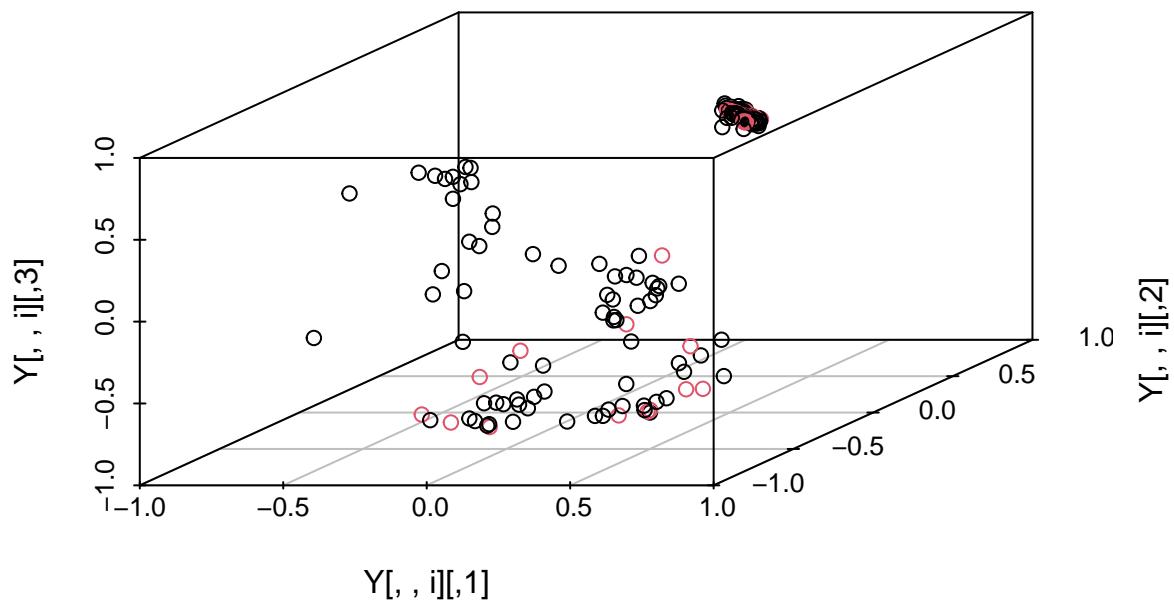
```
## [1] "Iteration 766"
## [1] "Iteration 767"
## [1] "Iteration 768"
## [1] "Iteration 769"
## [1] "Iteration 770"
## [1] "Iteration 770: objective function value is 2.136135"
```



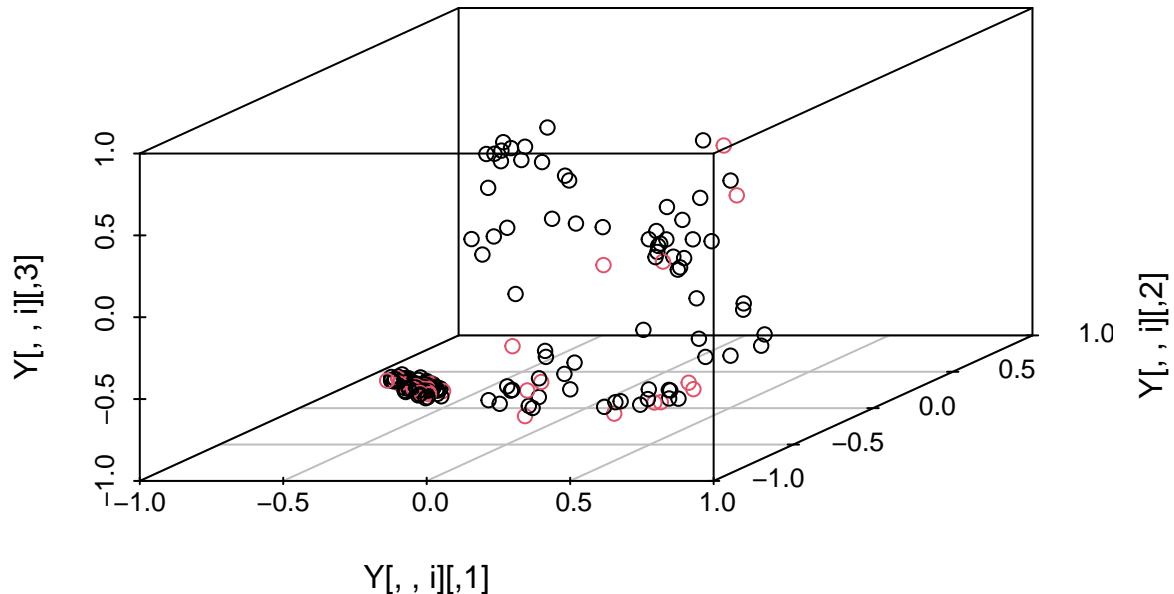
```
## [1] "Iteration 771"
## [1] "Iteration 772"
## [1] "Iteration 773"
## [1] "Iteration 774"
## [1] "Iteration 775"
## [1] "Iteration 775: objective function value is 2.326509"
```



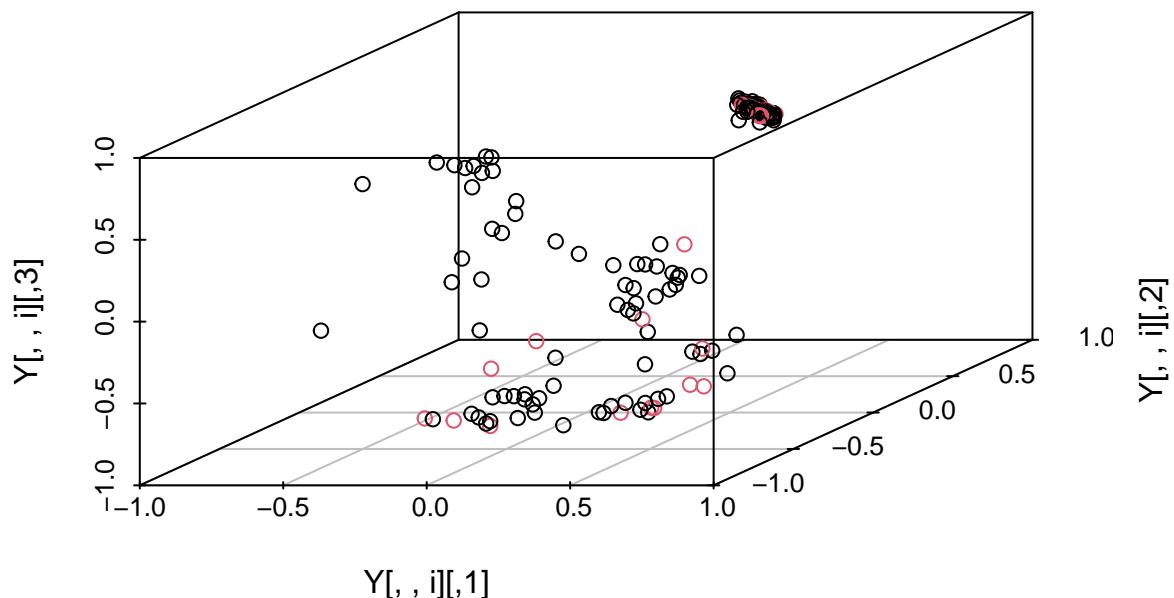
```
## [1] "Iteration 776"
## [1] "Iteration 777"
## [1] "Iteration 778"
## [1] "Iteration 779"
## [1] "Iteration 780"
## [1] "Iteration 780: objective function value is 2.138661"
```



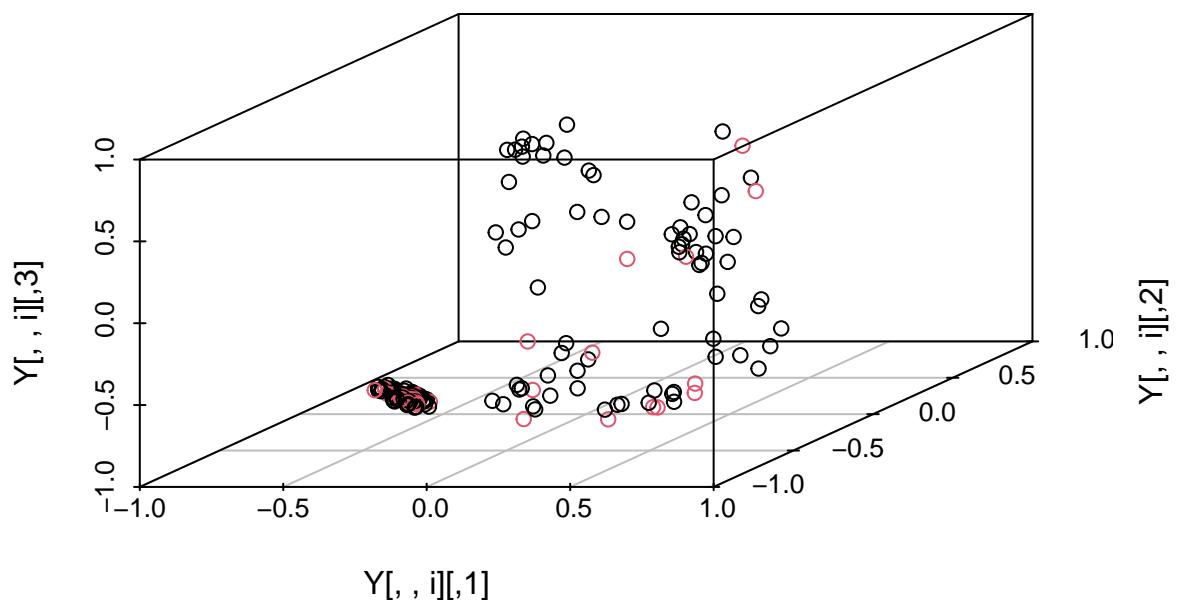
```
## [1] "Iteration 781"
## [1] "Iteration 782"
## [1] "Iteration 783"
## [1] "Iteration 784"
## [1] "Iteration 785"
## [1] "Iteration 785: objective function value is 2.316786"
```



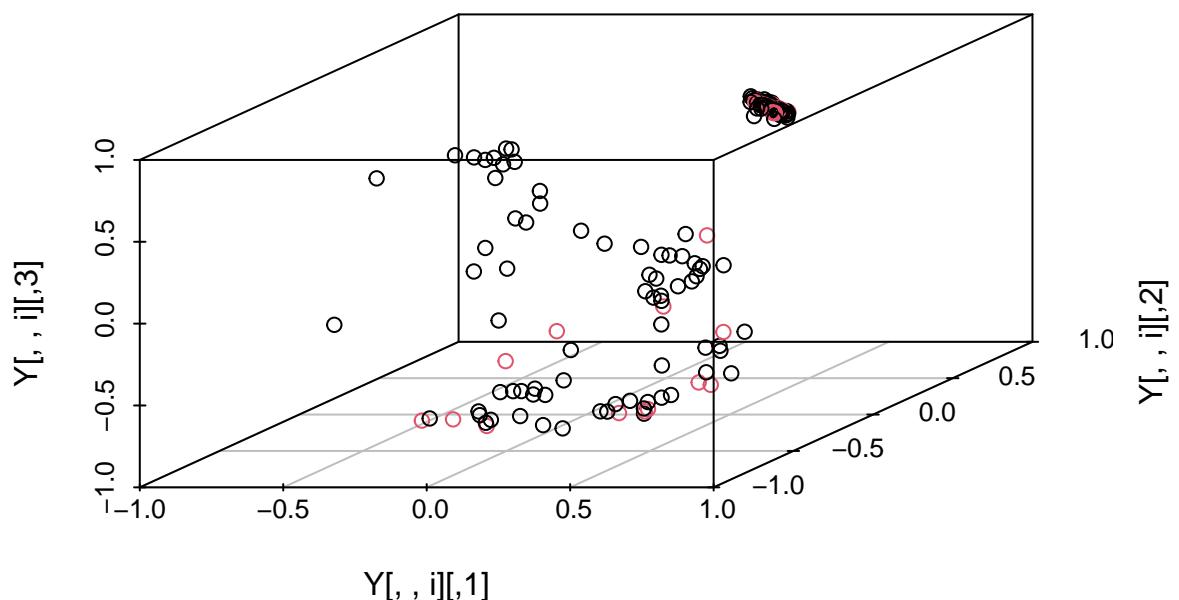
```
## [1] "Iteration 786"
## [1] "Iteration 787"
## [1] "Iteration 788"
## [1] "Iteration 789"
## [1] "Iteration 790"
## [1] "Iteration 790: objective function value is 2.149113"
```



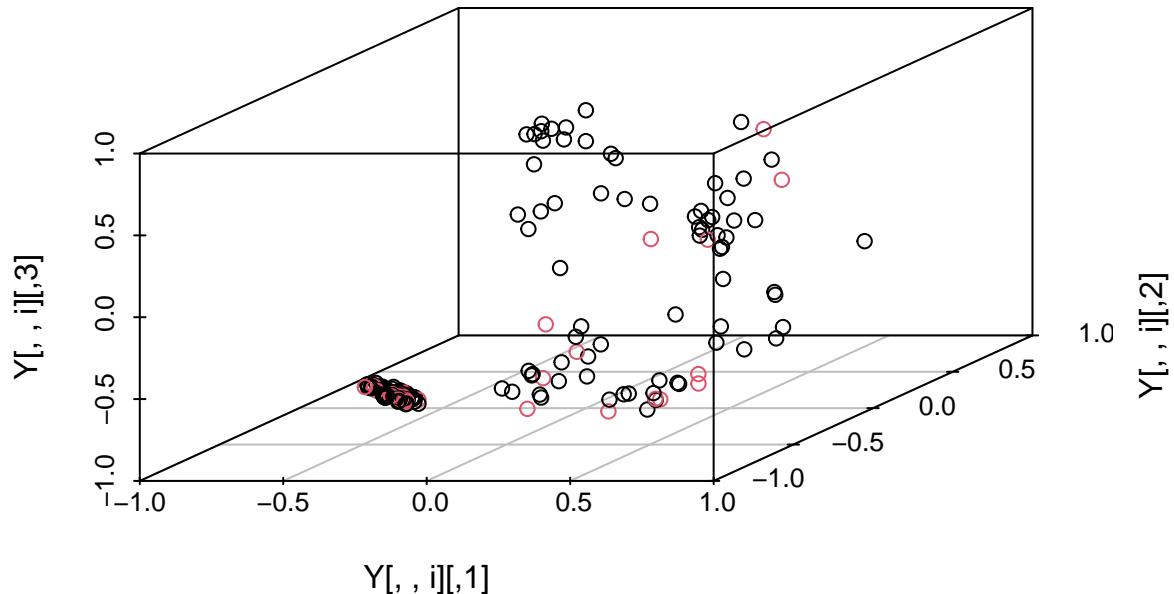
```
## [1] "Iteration 791"
## [1] "Iteration 792"
## [1] "Iteration 793"
## [1] "Iteration 794"
## [1] "Iteration 795"
## [1] "Iteration 795: objective function value is 2.327881"
```



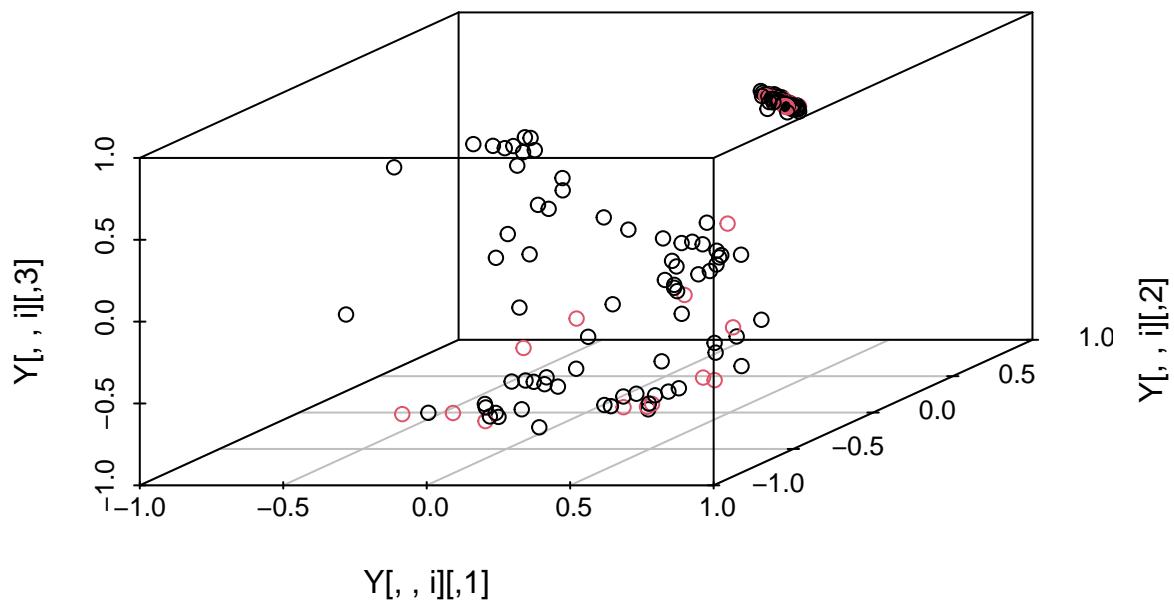
```
## [1] "Iteration 796"
## [1] "Iteration 797"
## [1] "Iteration 798"
## [1] "Iteration 799"
## [1] "Iteration 800"
## [1] "Iteration 800: objective function value is 2.131085"
```



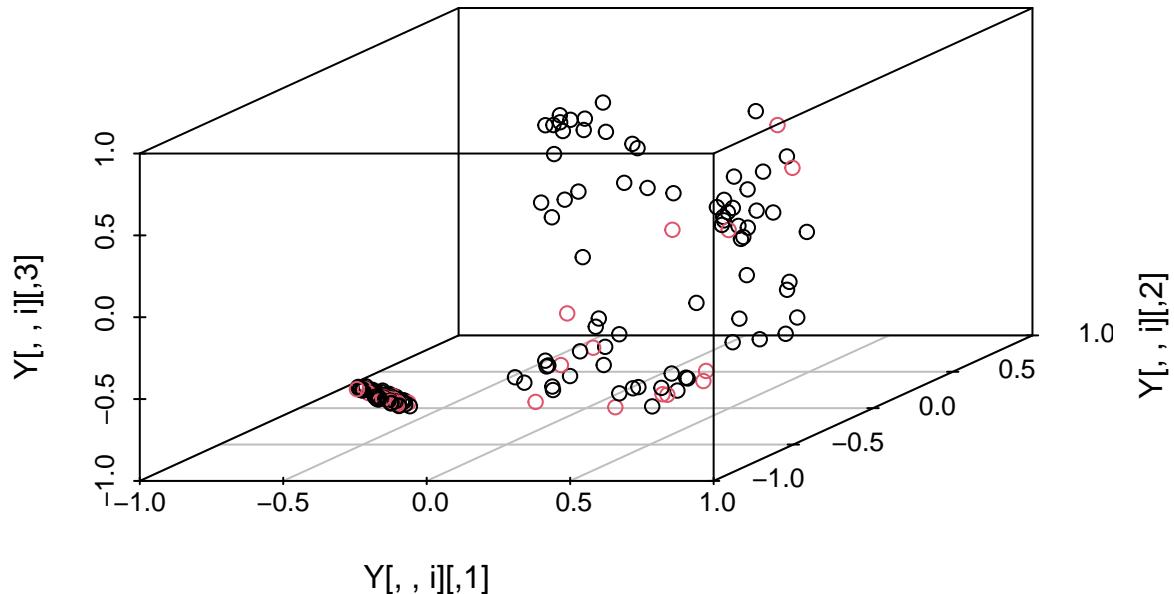
```
## [1] "Iteration 801"
## [1] "Iteration 802"
## [1] "Iteration 803"
## [1] "Iteration 804"
## [1] "Iteration 805"
## [1] "Iteration 805: objective function value is 2.322694"
```



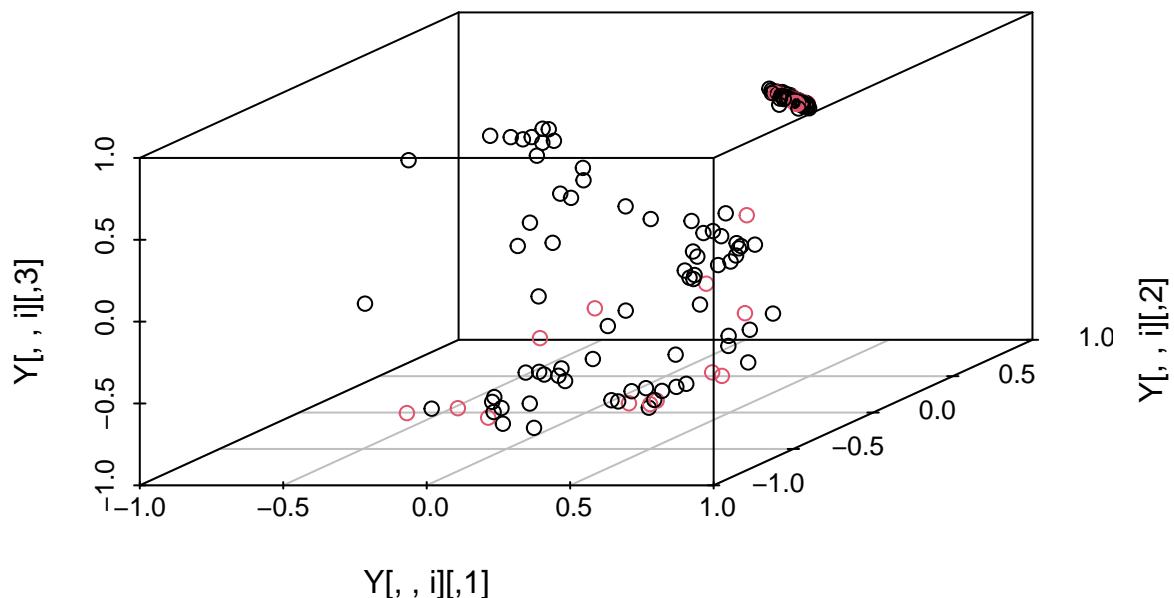
```
## [1] "Iteration 806"
## [1] "Iteration 807"
## [1] "Iteration 808"
## [1] "Iteration 809"
## [1] "Iteration 810"
## [1] "Iteration 810: objective function value is 2.135546"
```



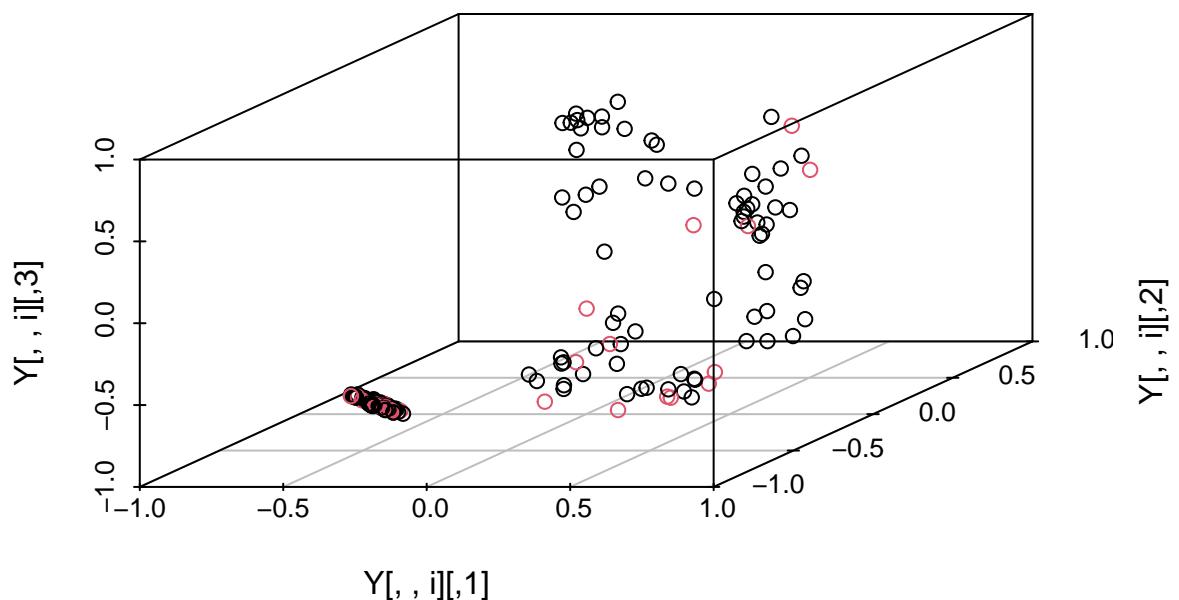
```
## [1] "Iteration 811"
## [1] "Iteration 812"
## [1] "Iteration 813"
## [1] "Iteration 814"
## [1] "Iteration 815"
## [1] "Iteration 815: objective function value is 2.324761"
```



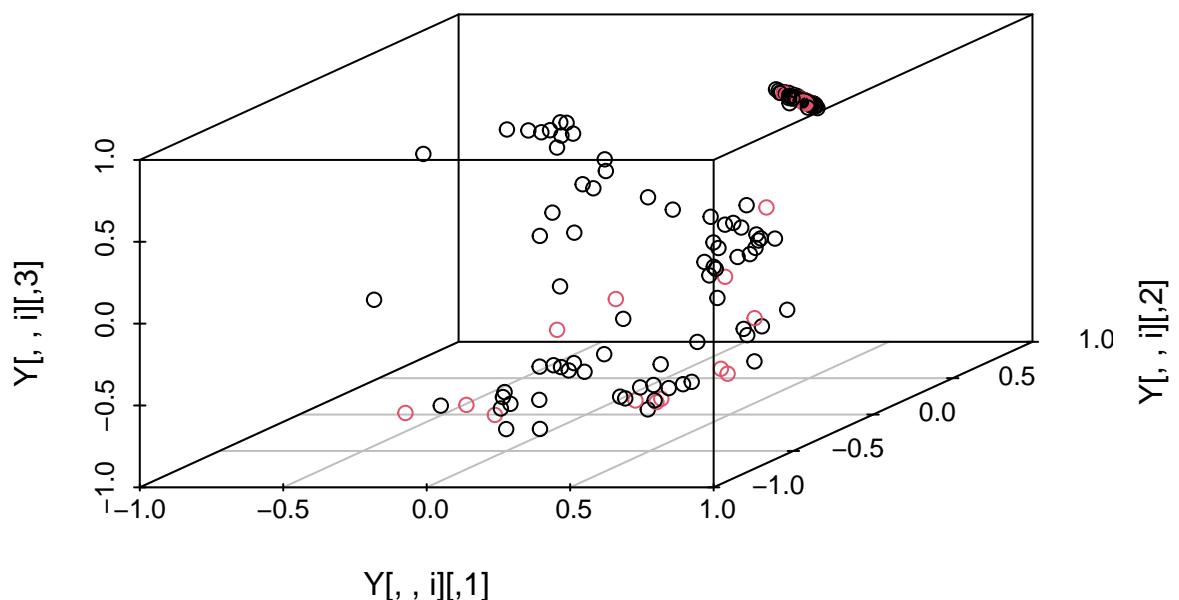
```
## [1] "Iteration 816"
## [1] "Iteration 817"
## [1] "Iteration 818"
## [1] "Iteration 819"
## [1] "Iteration 820"
## [1] "Iteration 820: objective function value is 2.133475"
```



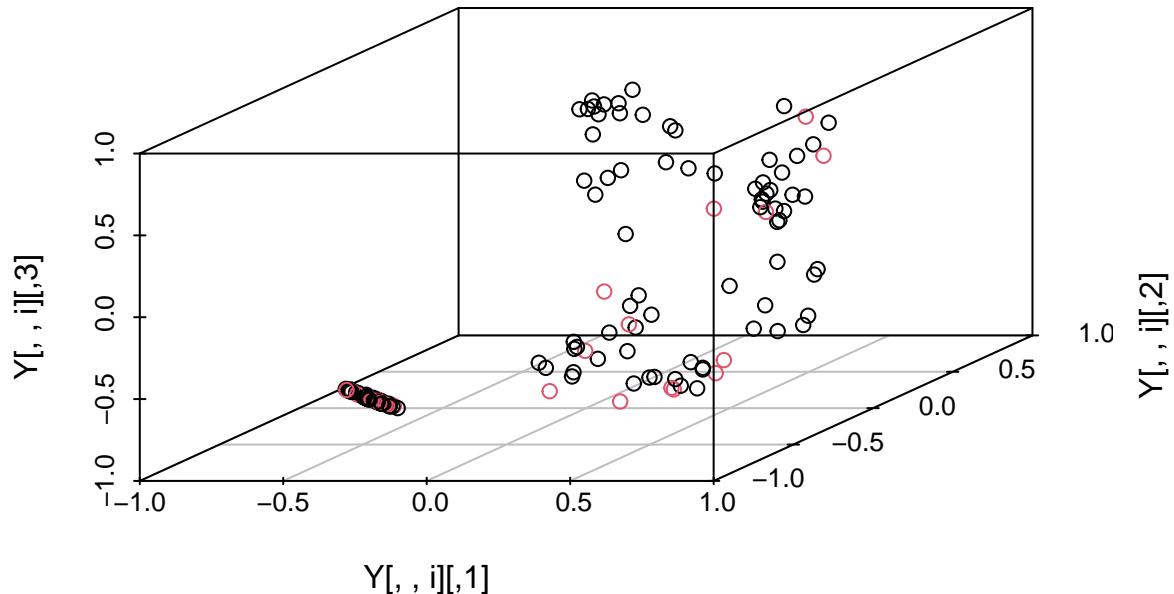
```
## [1] "Iteration 821"
## [1] "Iteration 822"
## [1] "Iteration 823"
## [1] "Iteration 824"
## [1] "Iteration 825"
## [1] "Iteration 825: objective function value is 2.320936"
```



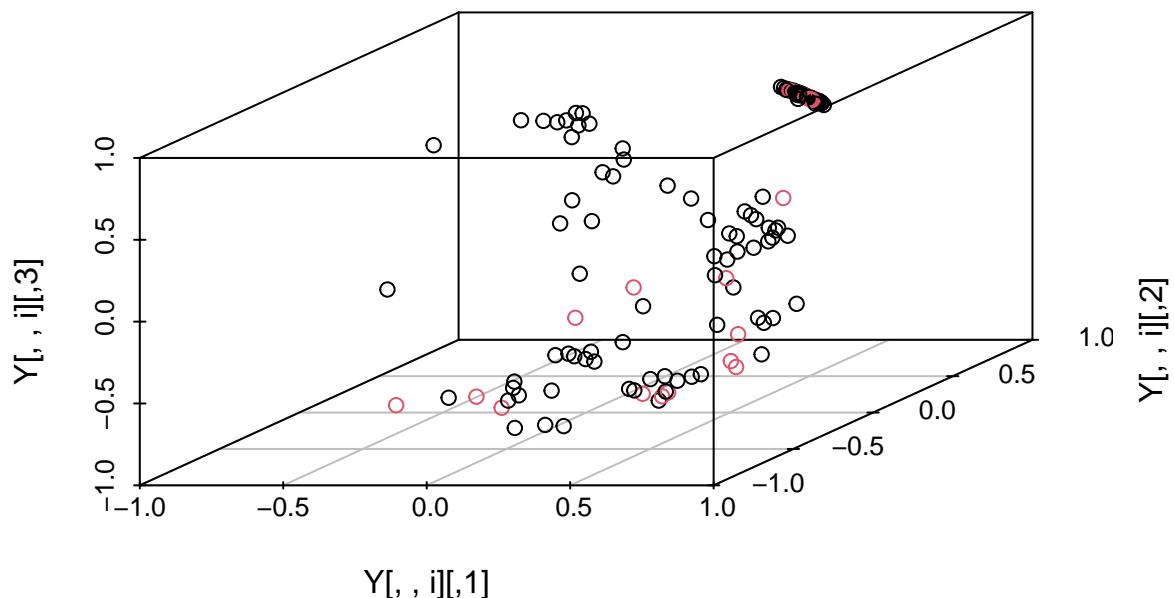
```
## [1] "Iteration 826"
## [1] "Iteration 827"
## [1] "Iteration 828"
## [1] "Iteration 829"
## [1] "Iteration 830"
## [1] "Iteration 830: objective function value is 2.135155"
```



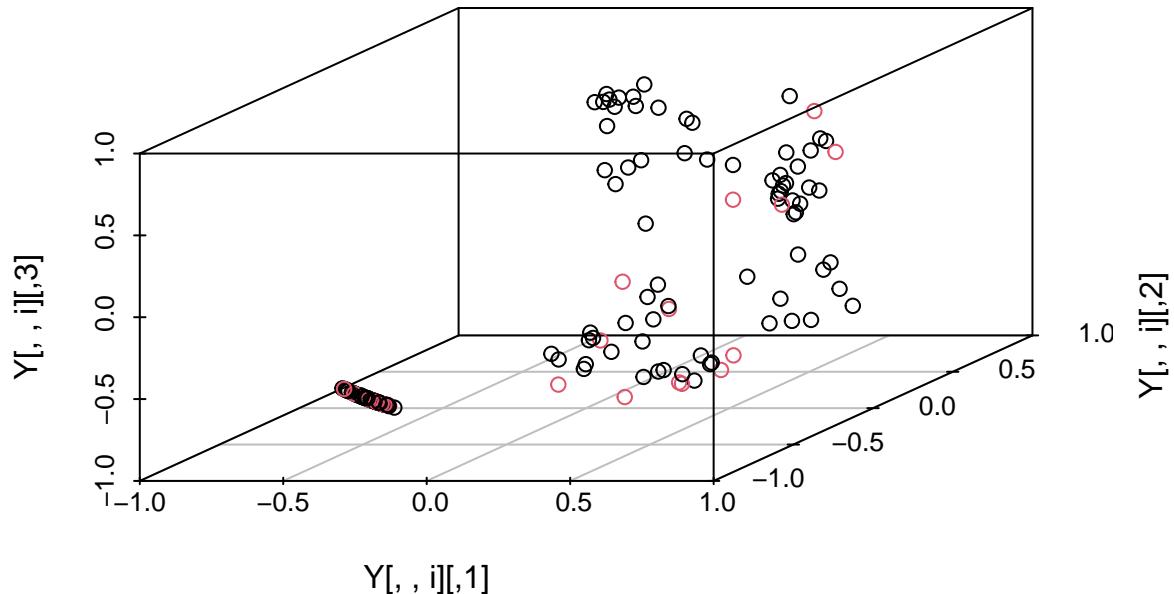
```
## [1] "Iteration 831"
## [1] "Iteration 832"
## [1] "Iteration 833"
## [1] "Iteration 834"
## [1] "Iteration 835"
## [1] "Iteration 835: objective function value is 2.329305"
```



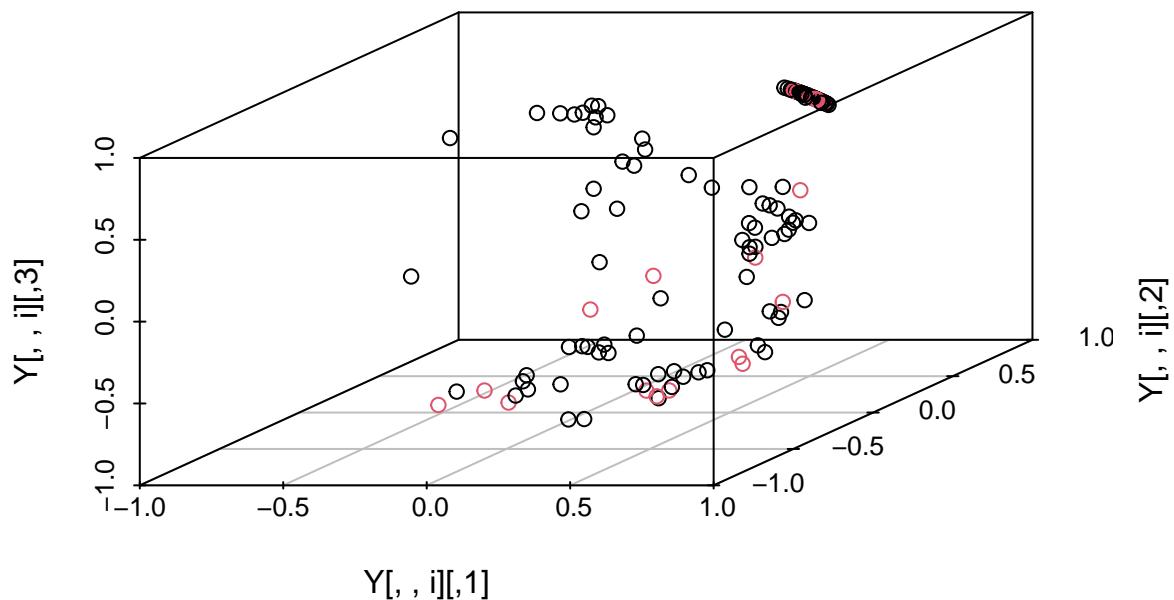
```
## [1] "Iteration 836"
## [1] "Iteration 837"
## [1] "Iteration 838"
## [1] "Iteration 839"
## [1] "Iteration 840"
## [1] "Iteration 840: objective function value is 2.151472"
```



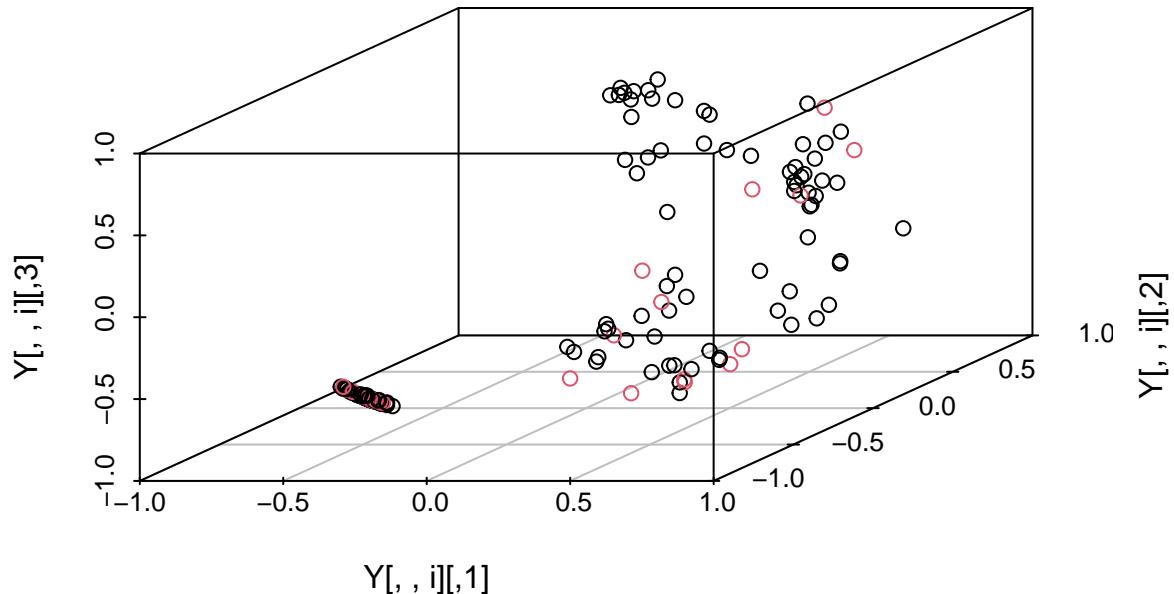
```
## [1] "Iteration 841"
## [1] "Iteration 842"
## [1] "Iteration 843"
## [1] "Iteration 844"
## [1] "Iteration 845"
## [1] "Iteration 845: objective function value is 2.336072"
```



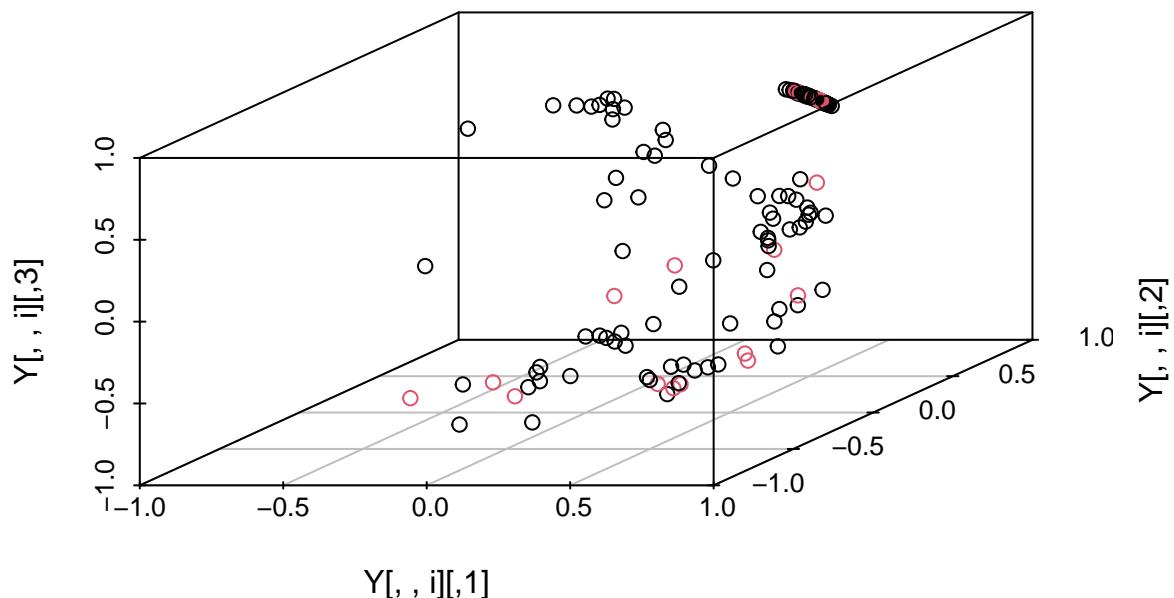
```
## [1] "Iteration 846"
## [1] "Iteration 847"
## [1] "Iteration 848"
## [1] "Iteration 849"
## [1] "Iteration 850"
## [1] "Iteration 850: objective function value is 2.132530"
```



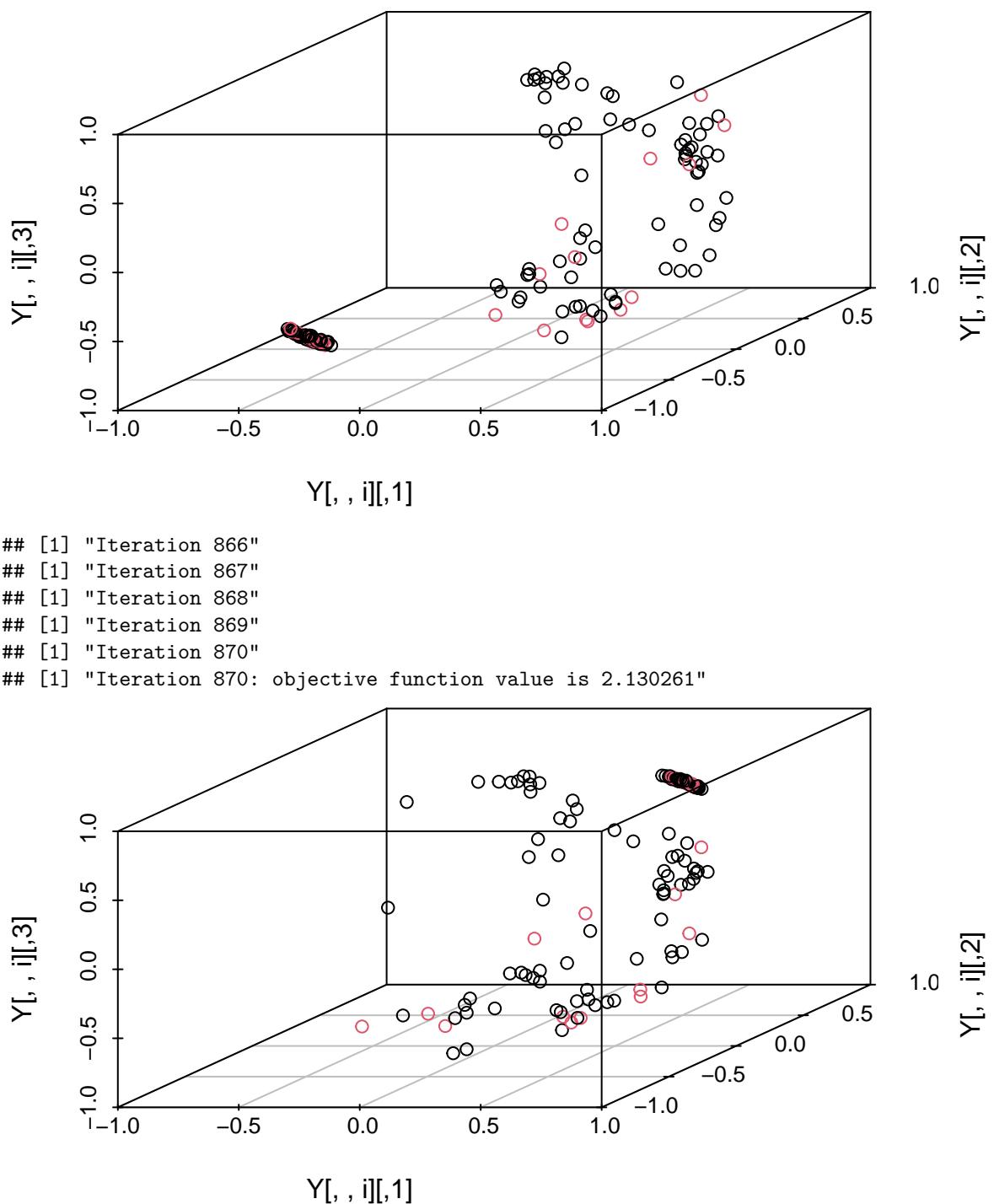
```
## [1] "Iteration 851"
## [1] "Iteration 852"
## [1] "Iteration 853"
## [1] "Iteration 854"
## [1] "Iteration 855"
## [1] "Iteration 855: objective function value is 2.321774"
```



```
## [1] "Iteration 856"
## [1] "Iteration 857"
## [1] "Iteration 858"
## [1] "Iteration 859"
## [1] "Iteration 860"
## [1] "Iteration 860: objective function value is 2.138133"
```



```
## [1] "Iteration 861"
## [1] "Iteration 862"
## [1] "Iteration 863"
## [1] "Iteration 864"
## [1] "Iteration 865"
## [1] "Iteration 865: objective function value is 2.322928"
```

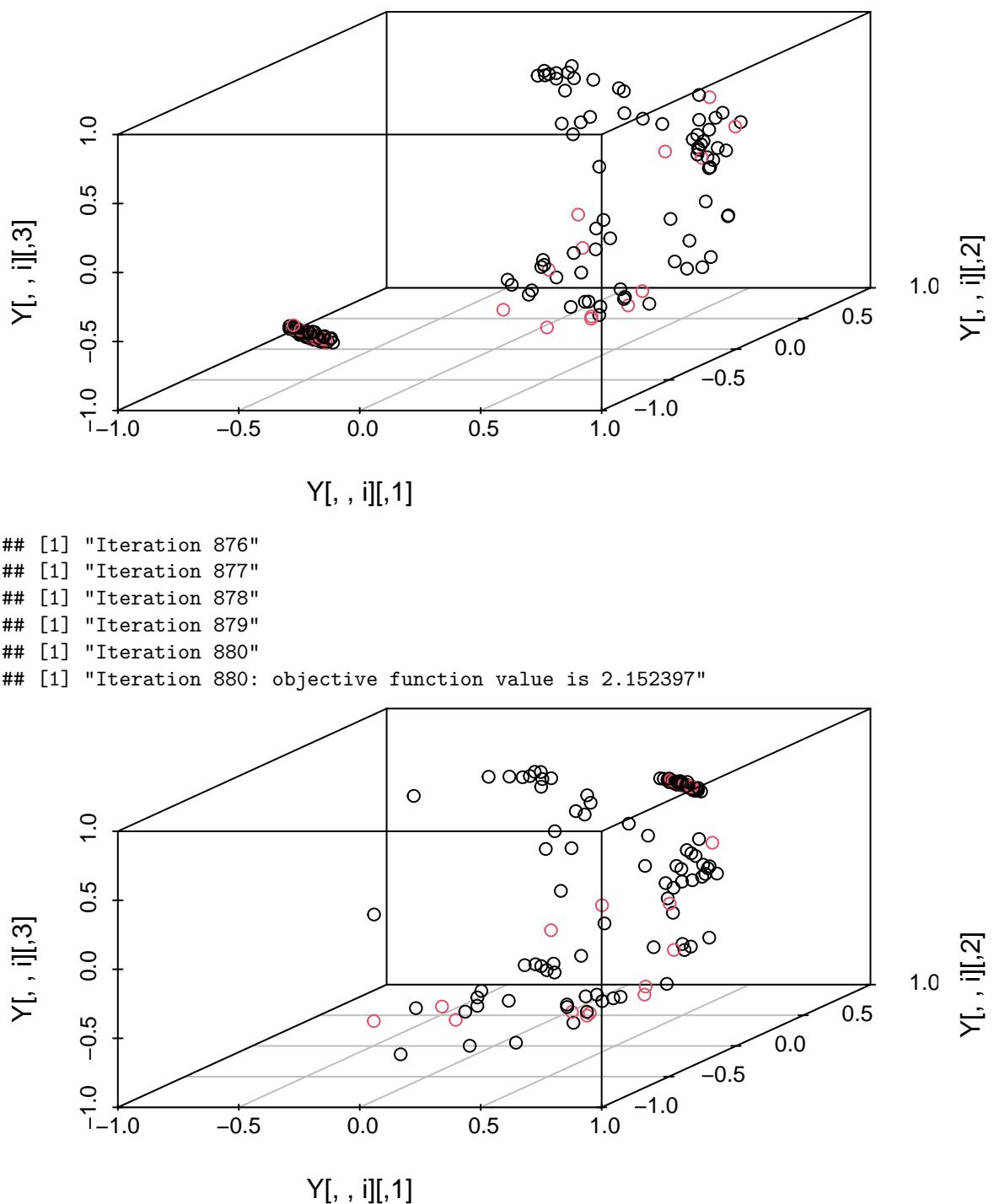


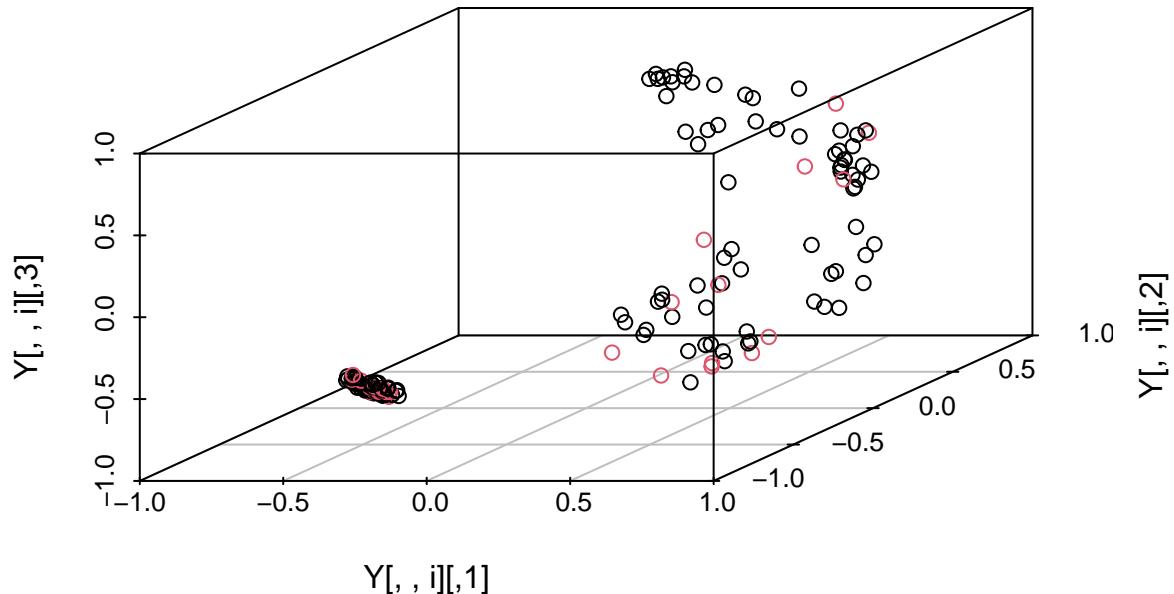
```

## [1] "Iteration 866"
## [1] "Iteration 867"
## [1] "Iteration 868"
## [1] "Iteration 869"
## [1] "Iteration 870"
## [1] "Iteration 870: objective function value is 2.130261"

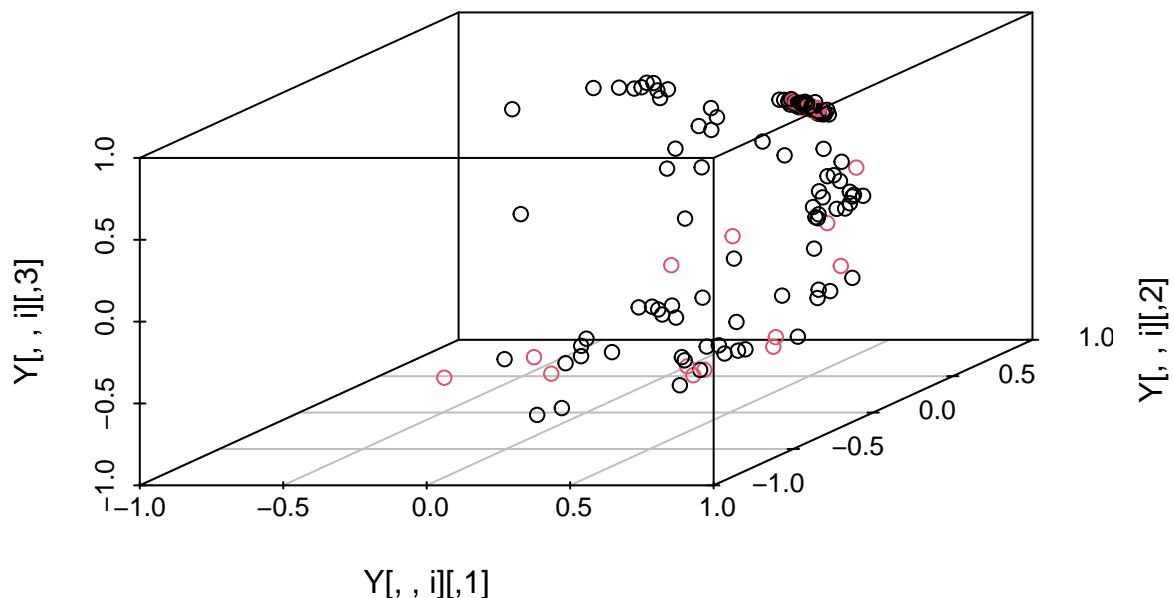
## [1] "Iteration 871"
## [1] "Iteration 872"
## [1] "Iteration 873"
## [1] "Iteration 874"
## [1] "Iteration 875"
## [1] "Iteration 875: objective function value is 2.327906"

```

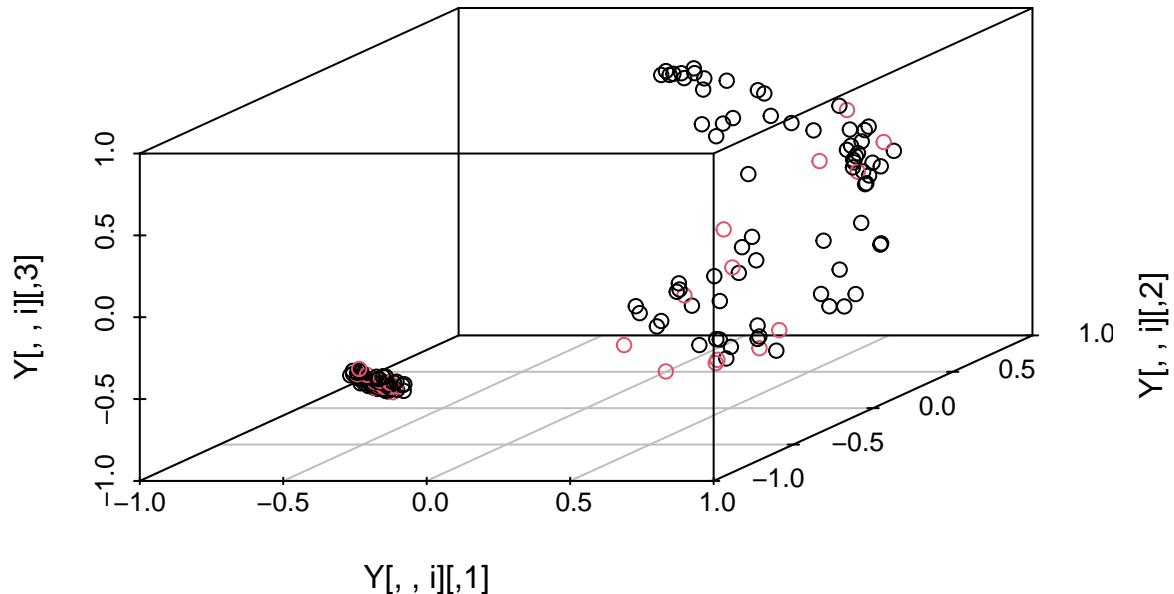




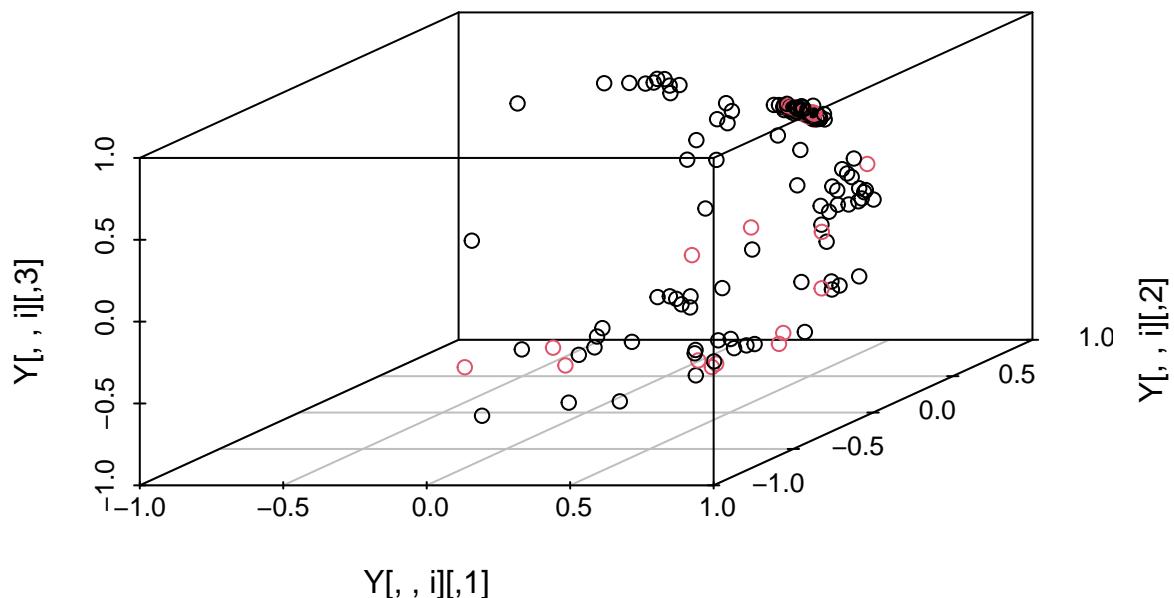
```
## [1] "Iteration 886"
## [1] "Iteration 887"
## [1] "Iteration 888"
## [1] "Iteration 889"
## [1] "Iteration 890"
## [1] "Iteration 890: objective function value is 2.131973"
```



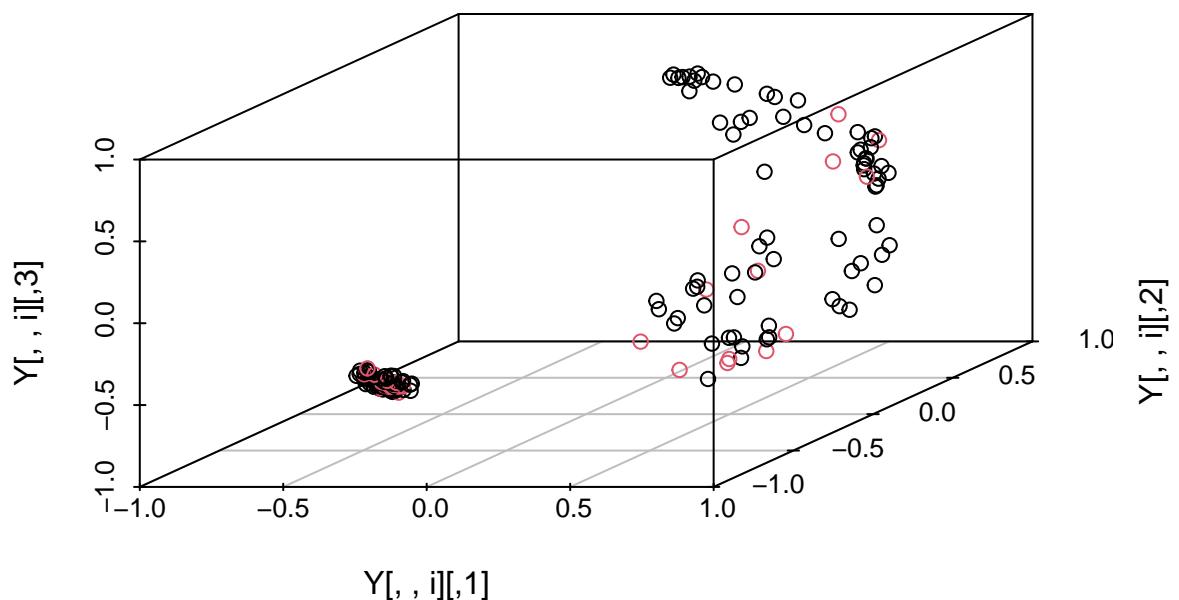
```
## [1] "Iteration 891"
## [1] "Iteration 892"
## [1] "Iteration 893"
## [1] "Iteration 894"
## [1] "Iteration 895"
## [1] "Iteration 895: objective function value is 2.325569"
```



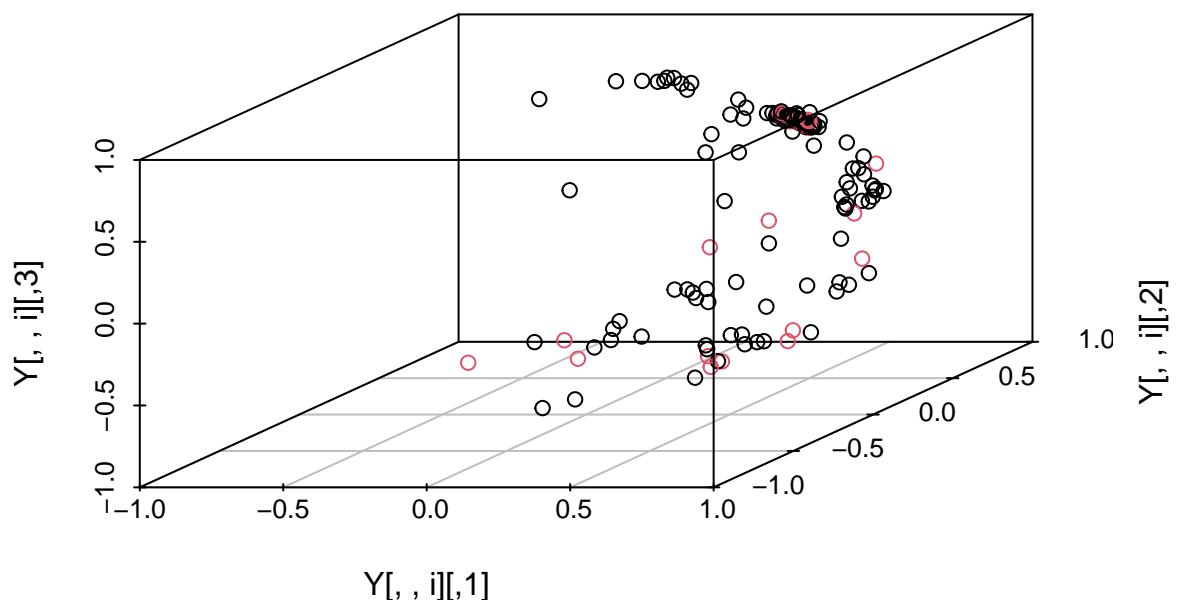
```
## [1] "Iteration 896"
## [1] "Iteration 897"
## [1] "Iteration 898"
## [1] "Iteration 899"
## [1] "Iteration 900"
## [1] "Iteration 900: objective function value is 2.155421"
```



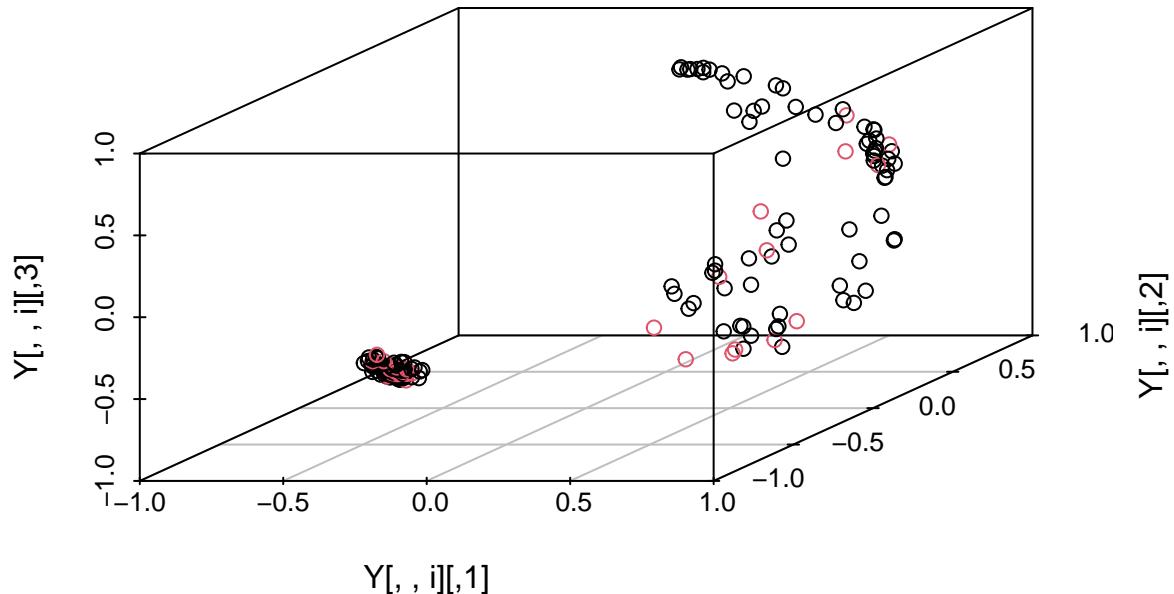
```
## [1] "Iteration 901"
## [1] "Iteration 902"
## [1] "Iteration 903"
## [1] "Iteration 904"
## [1] "Iteration 905"
## [1] "Iteration 905: objective function value is 2.318856"
```



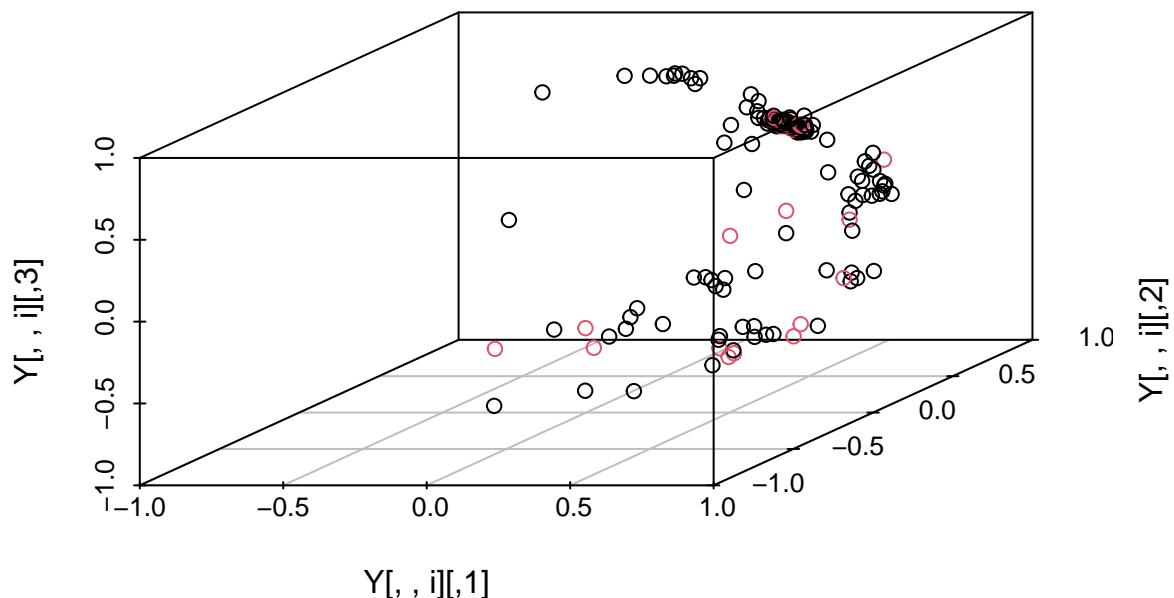
```
## [1] "Iteration 906"
## [1] "Iteration 907"
## [1] "Iteration 908"
## [1] "Iteration 909"
## [1] "Iteration 910"
## [1] "Iteration 910: objective function value is 2.132287"
```



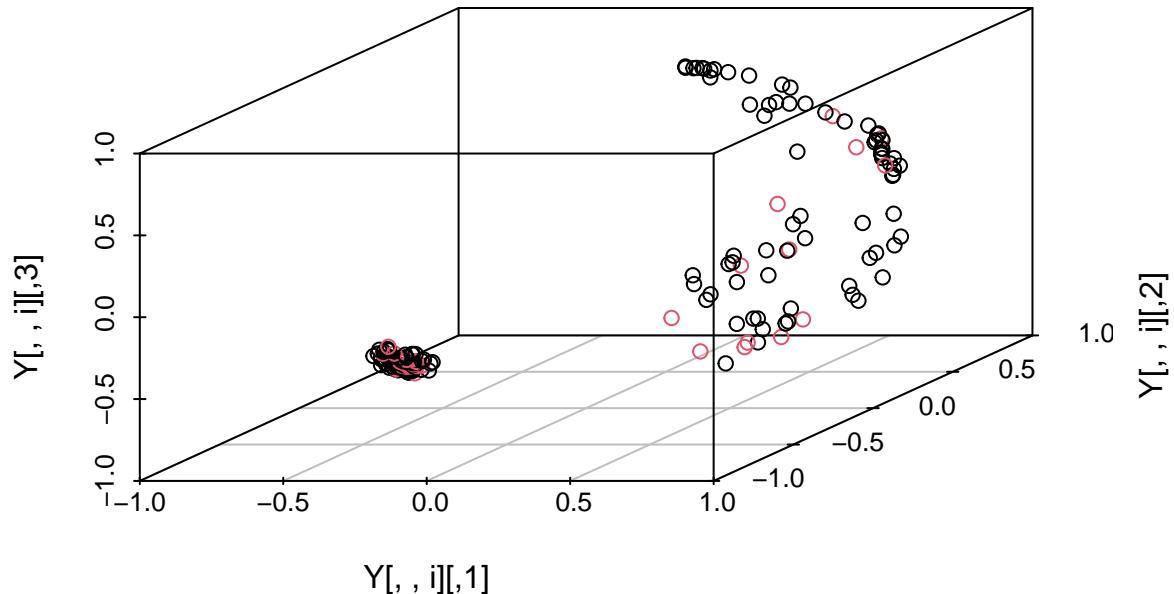
```
## [1] "Iteration 911"
## [1] "Iteration 912"
## [1] "Iteration 913"
## [1] "Iteration 914"
## [1] "Iteration 915"
## [1] "Iteration 915: objective function value is 2.325321"
```



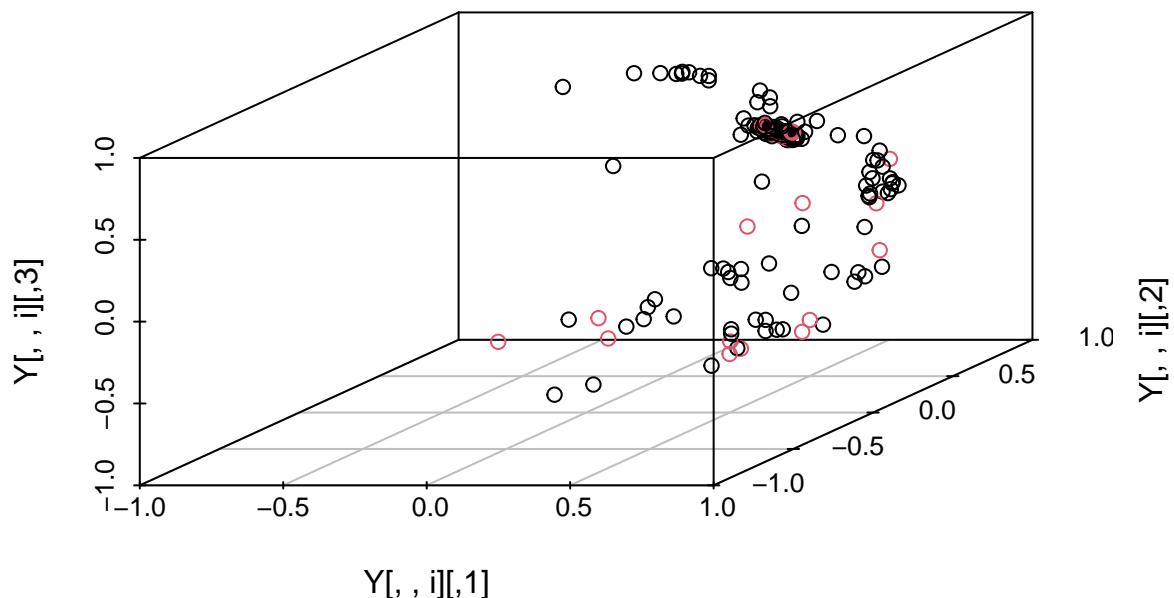
```
## [1] "Iteration 916"
## [1] "Iteration 917"
## [1] "Iteration 918"
## [1] "Iteration 919"
## [1] "Iteration 920"
## [1] "Iteration 920: objective function value is 2.155577"
```



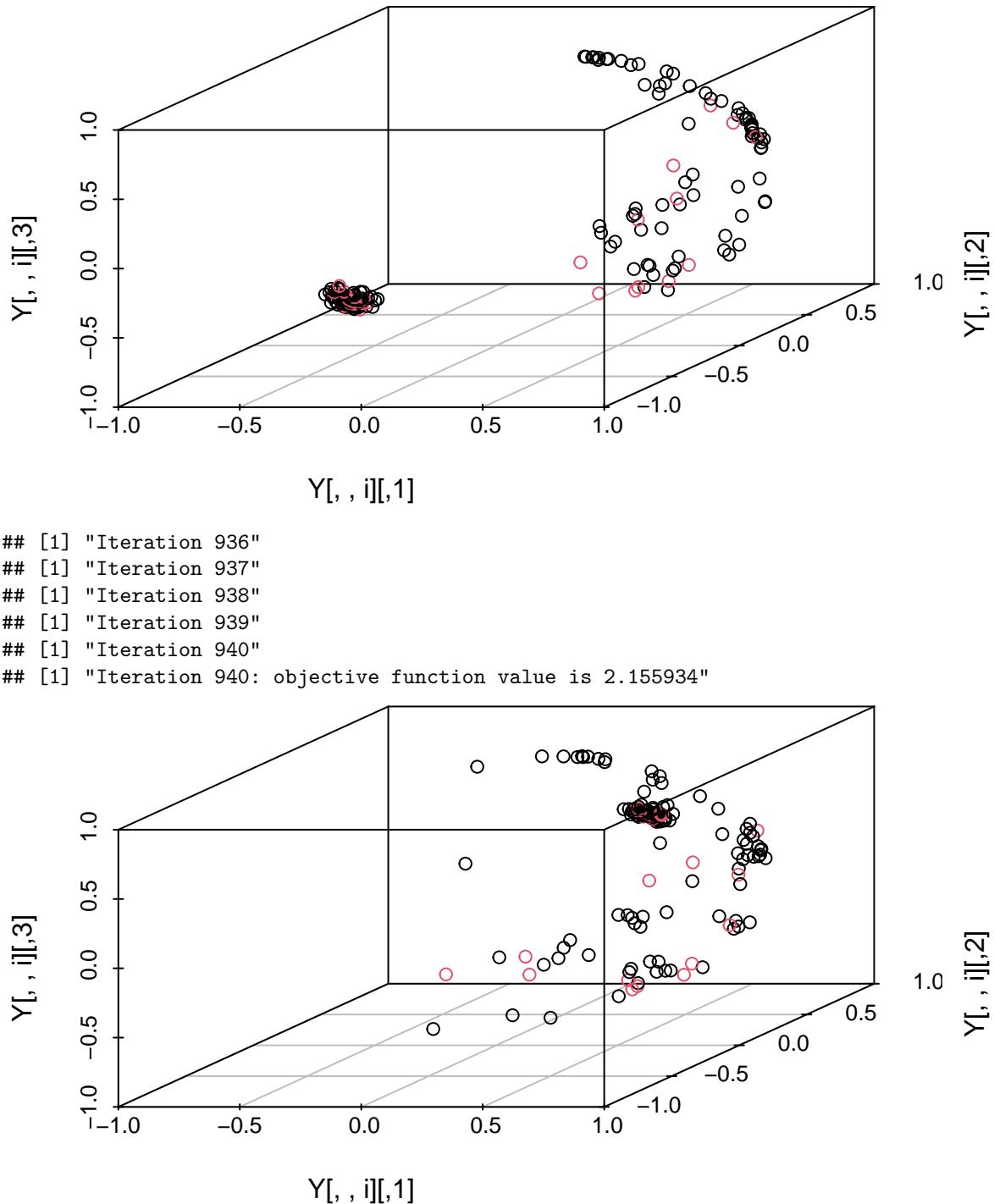
```
## [1] "Iteration 921"
## [1] "Iteration 922"
## [1] "Iteration 923"
## [1] "Iteration 924"
## [1] "Iteration 925"
## [1] "Iteration 925: objective function value is 2.318621"
```



```
## [1] "Iteration 926"
## [1] "Iteration 927"
## [1] "Iteration 928"
## [1] "Iteration 929"
## [1] "Iteration 930"
## [1] "Iteration 930: objective function value is 2.132500"
```



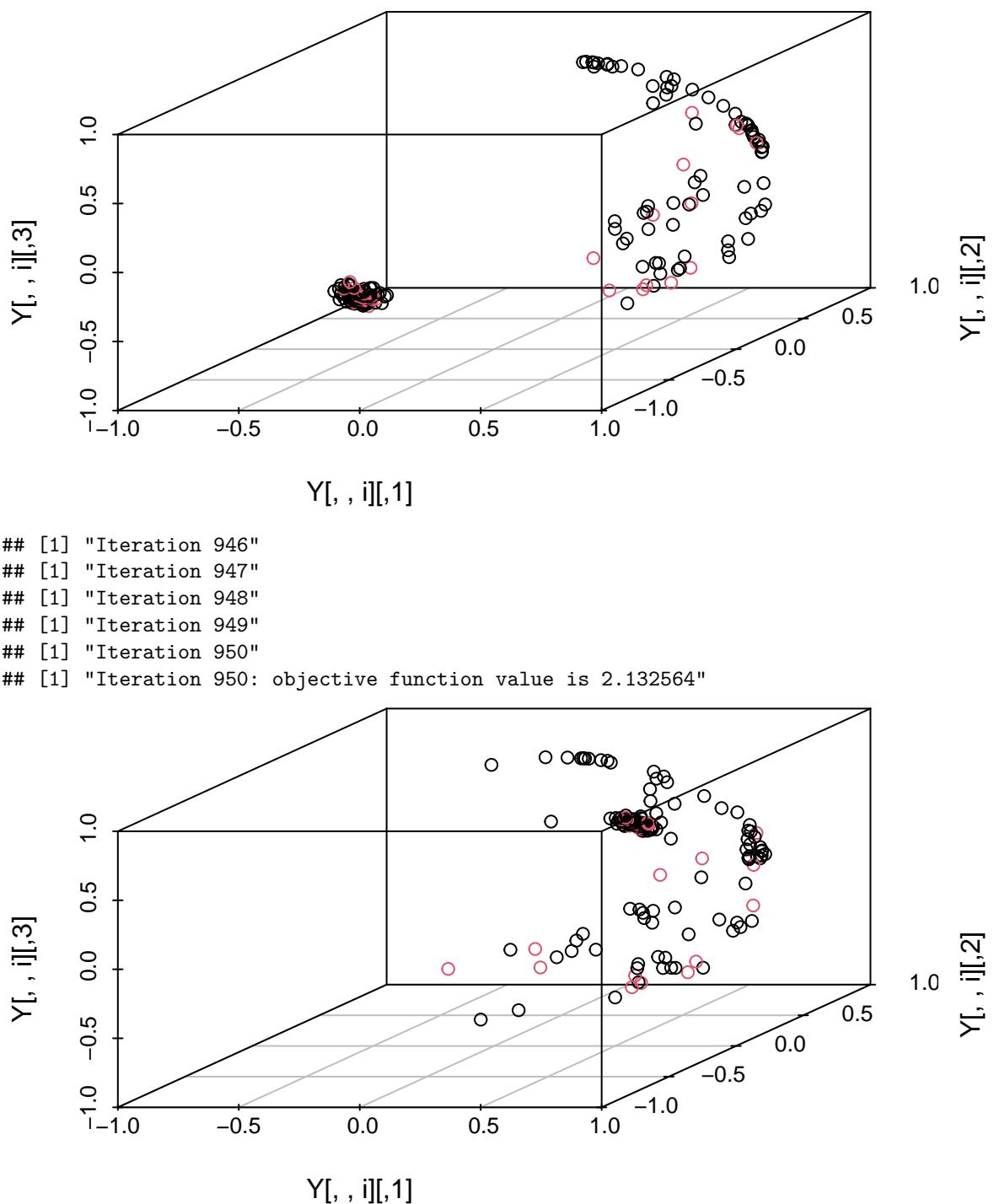
```
## [1] "Iteration 931"
## [1] "Iteration 932"
## [1] "Iteration 933"
## [1] "Iteration 934"
## [1] "Iteration 935"
## [1] "Iteration 935: objective function value is 2.324823"
```



```

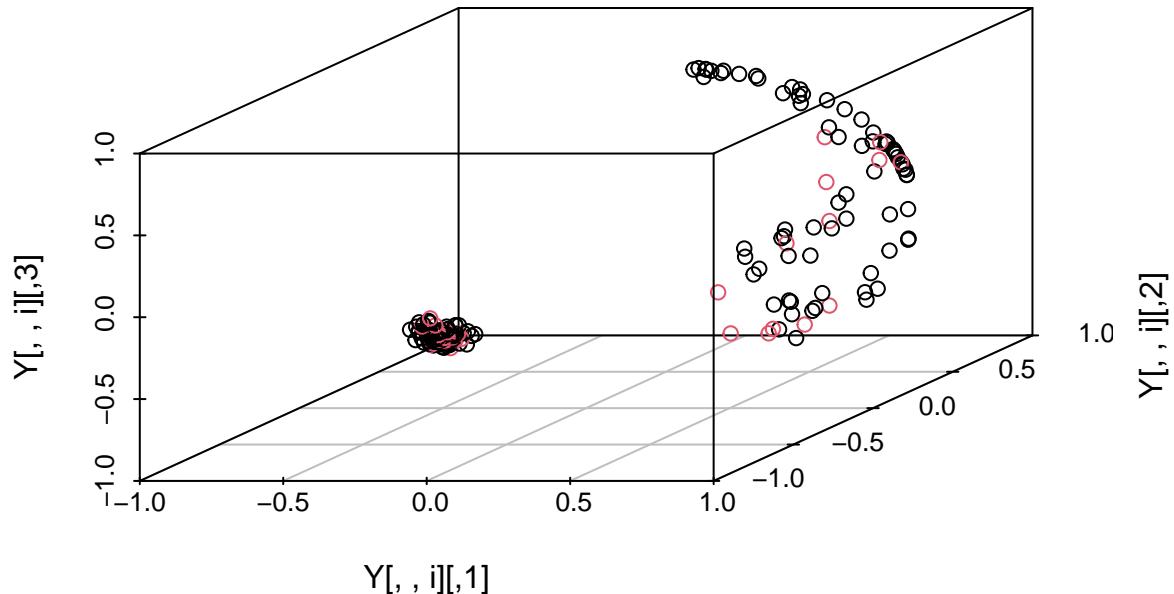
## [1] "Iteration 941"
## [1] "Iteration 942"
## [1] "Iteration 943"
## [1] "Iteration 944"
## [1] "Iteration 945"
## [1] "Iteration 945: objective function value is 2.318715"

```

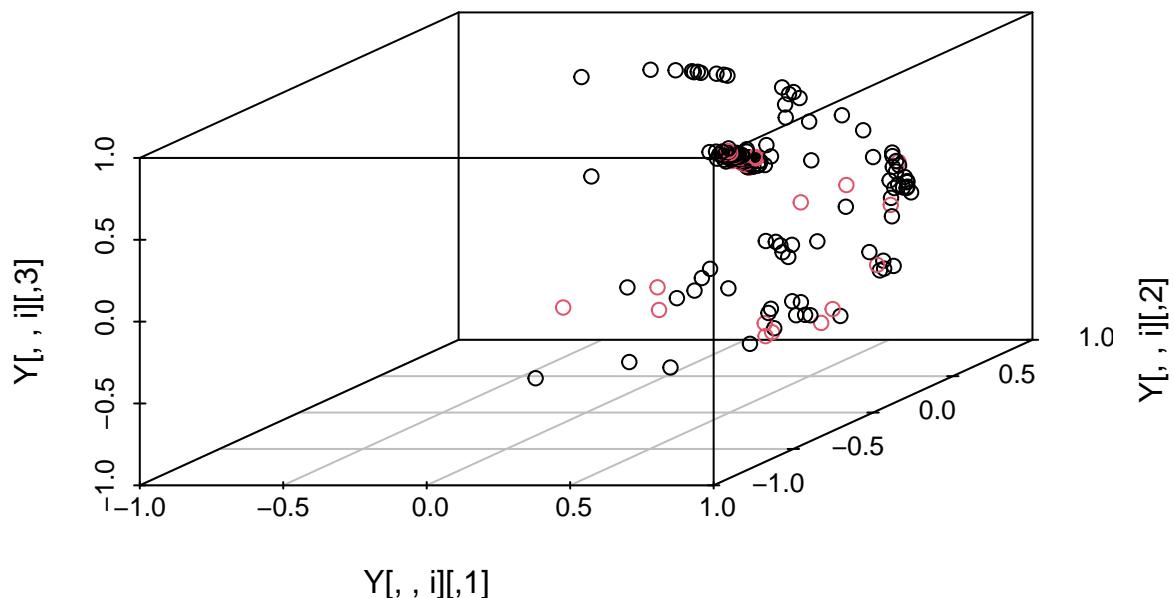


```
## [1] "Iteration 946"
## [1] "Iteration 947"
## [1] "Iteration 948"
## [1] "Iteration 949"
## [1] "Iteration 950"
## [1] "Iteration 950: objective function value is 2.132564"
```

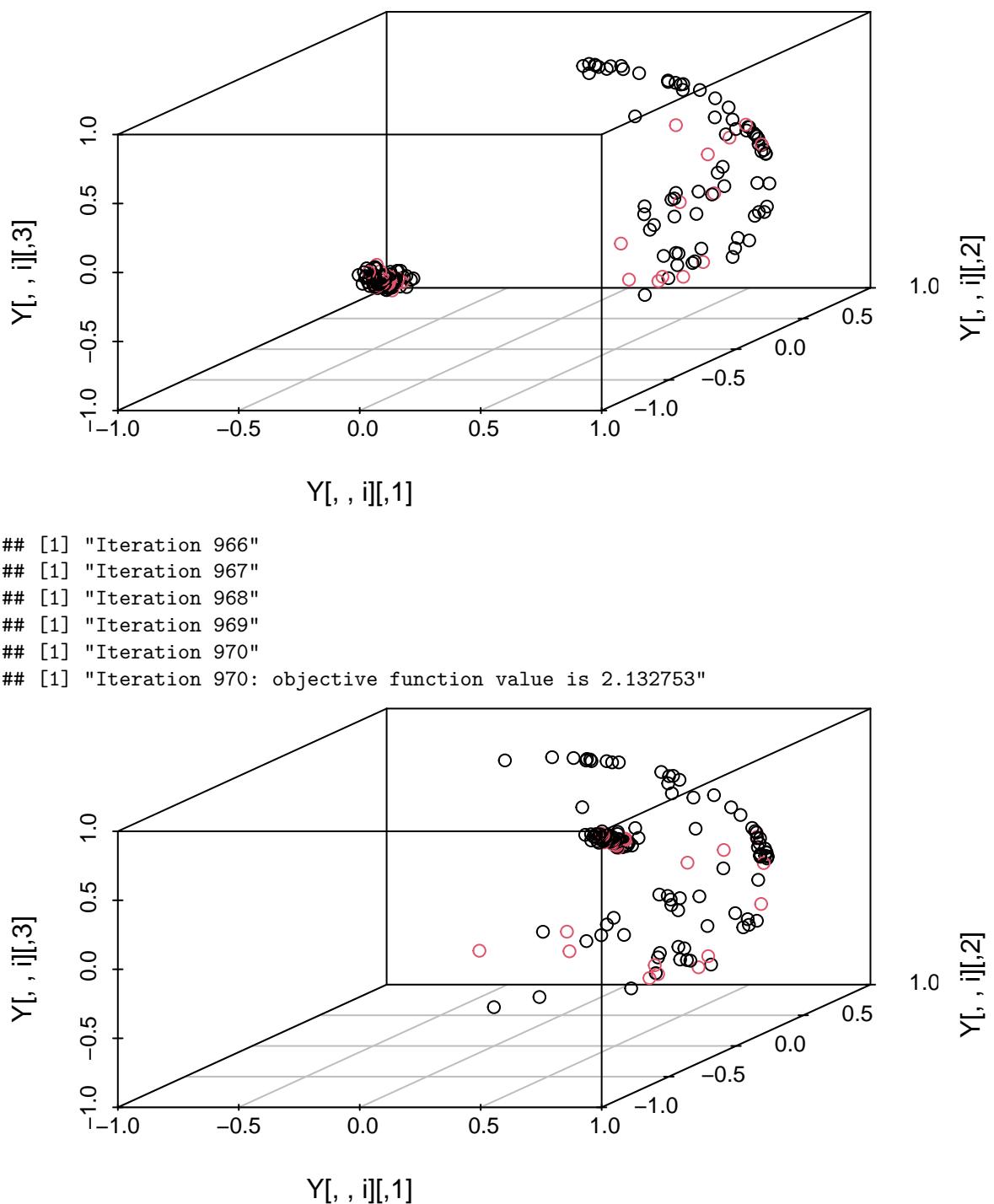
```
## [1] "Iteration 951"
## [1] "Iteration 952"
## [1] "Iteration 953"
## [1] "Iteration 954"
## [1] "Iteration 955"
## [1] "Iteration 955: objective function value is 2.324721"
```



```
## [1] "Iteration 956"
## [1] "Iteration 957"
## [1] "Iteration 958"
## [1] "Iteration 959"
## [1] "Iteration 960"
## [1] "Iteration 960: objective function value is 2.155867"
```

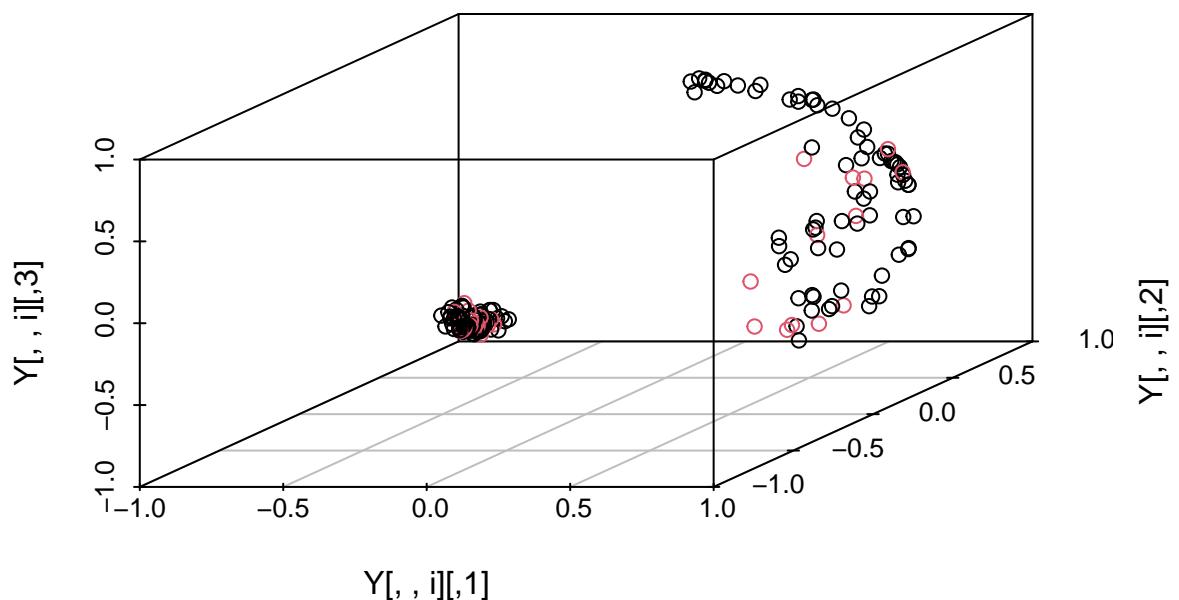


```
## [1] "Iteration 961"
## [1] "Iteration 962"
## [1] "Iteration 963"
## [1] "Iteration 964"
## [1] "Iteration 965"
## [1] "Iteration 965: objective function value is 2.318884"
```

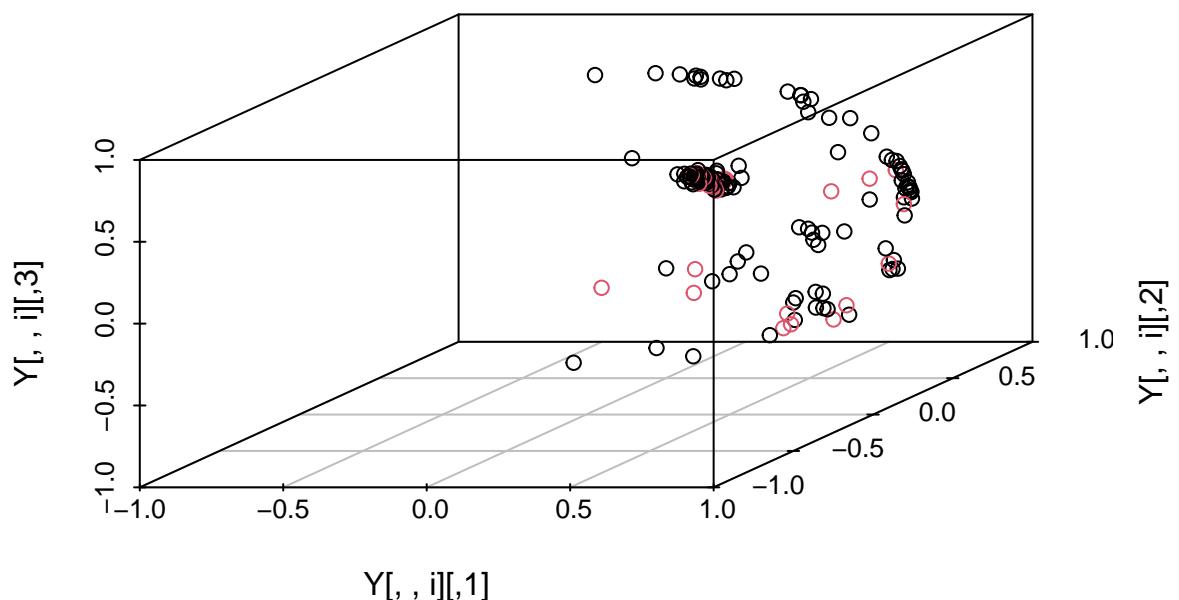


```
## [1] "Iteration 966"
## [1] "Iteration 967"
## [1] "Iteration 968"
## [1] "Iteration 969"
## [1] "Iteration 970"
## [1] "Iteration 970: objective function value is 2.132753"
```

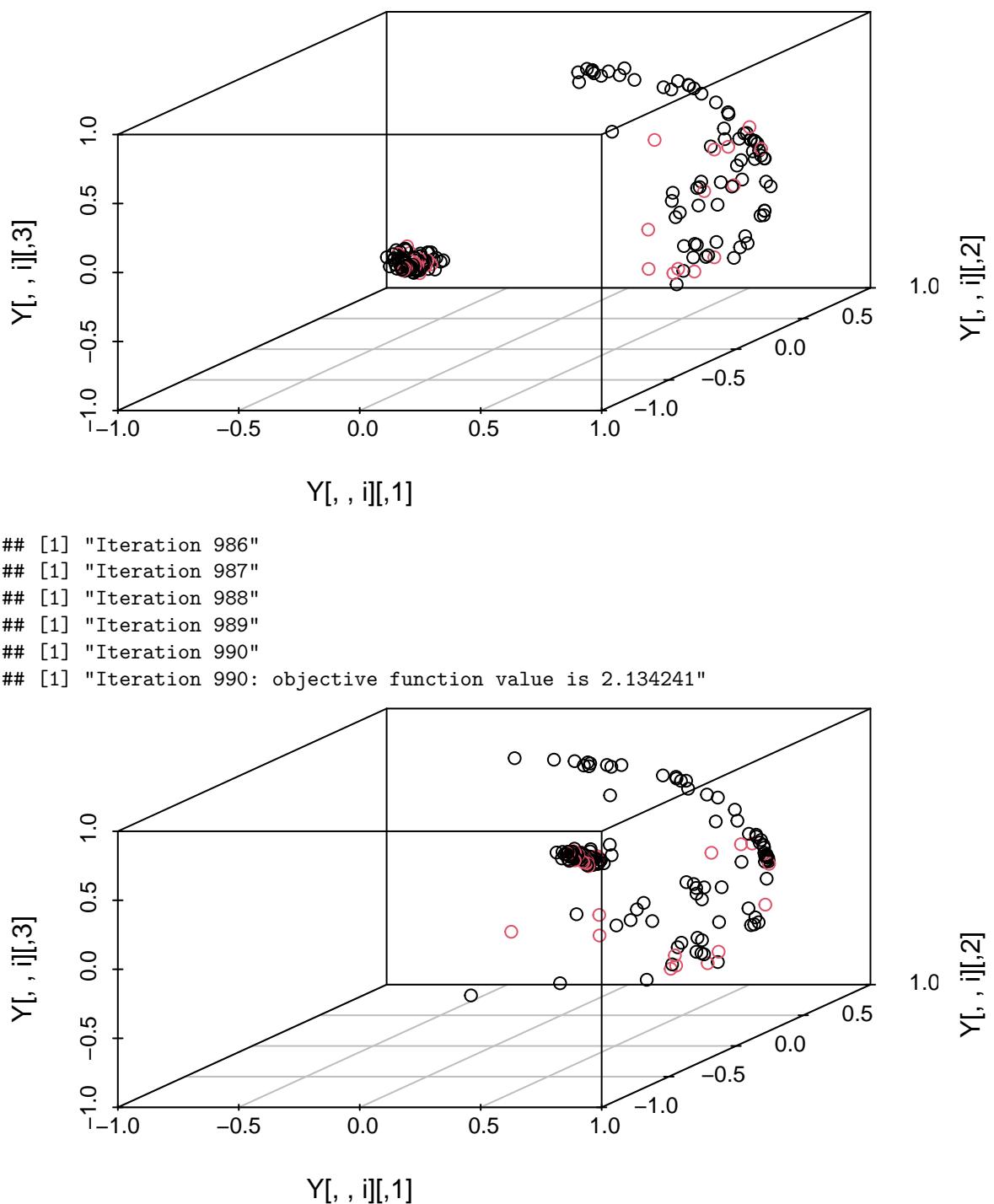
```
## [1] "Iteration 971"
## [1] "Iteration 972"
## [1] "Iteration 973"
## [1] "Iteration 974"
## [1] "Iteration 975"
## [1] "Iteration 975: objective function value is 2.324312"
```

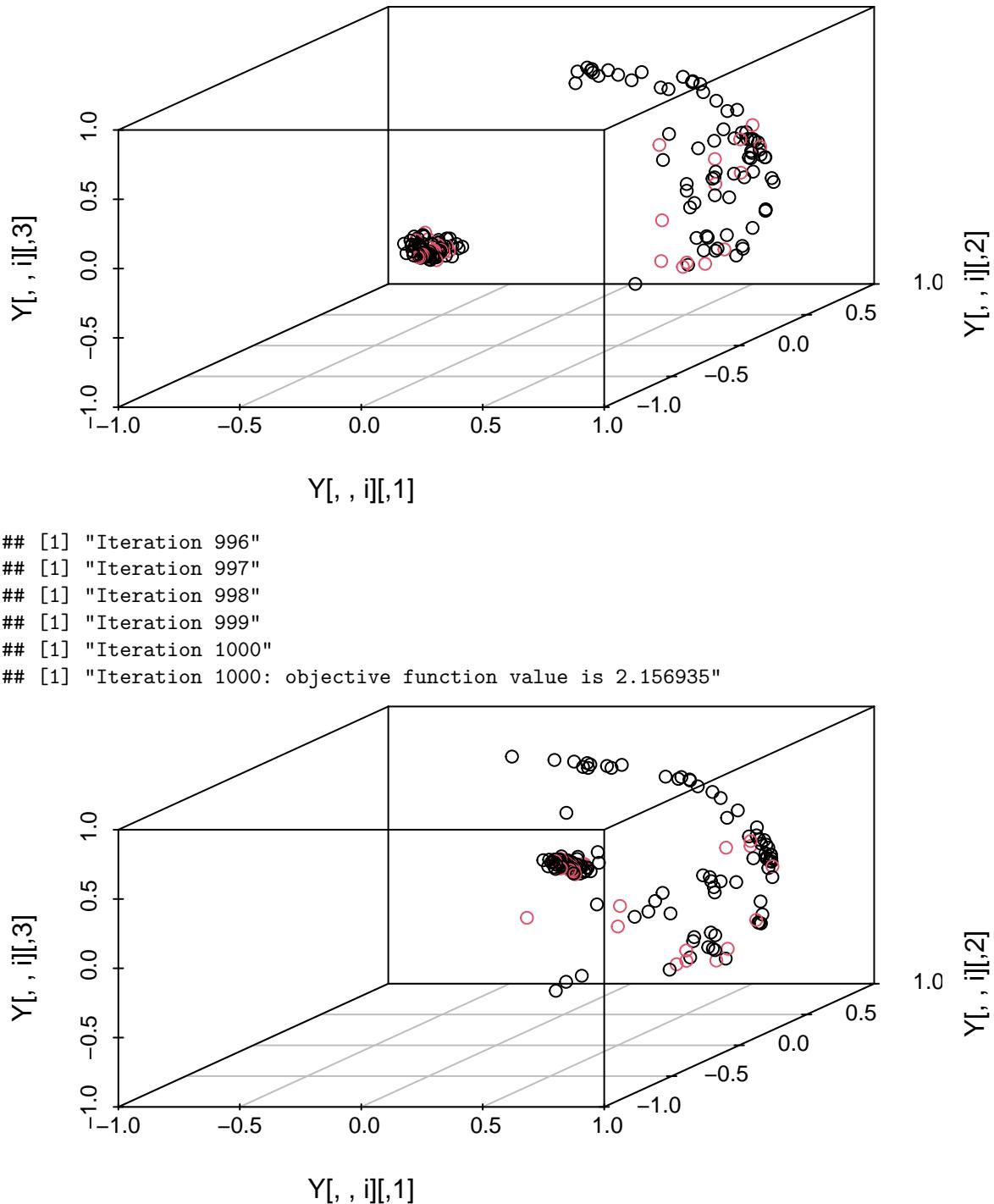


```
## [1] "Iteration 976"
## [1] "Iteration 977"
## [1] "Iteration 978"
## [1] "Iteration 979"
## [1] "Iteration 980"
## [1] "Iteration 980: objective function value is 2.155805"
```



```
## [1] "Iteration 981"
## [1] "Iteration 982"
## [1] "Iteration 983"
## [1] "Iteration 984"
## [1] "Iteration 985"
## [1] "Iteration 985: objective function value is 2.320120"
```





```

rgl::plot3d(0, 0, 0, xlim = c(-1, 1), ylim = c(-1, 1), zlim = c(-1, 1),
            radius = 1, type = "s", col = "lightgray",
            lit = FALSE)
rgl::points3d(Y[, , 1002], col = ifelse(ids_labs, 2, 1))
scatterplot3d::scatterplot3d(Y[, , 1002], xlim = c(-1, 1), ylim = c(-1, 1), zlim = c(-1, 1),
                             color = ifelse(ids_labs, 2, 1))

```

