ICA13

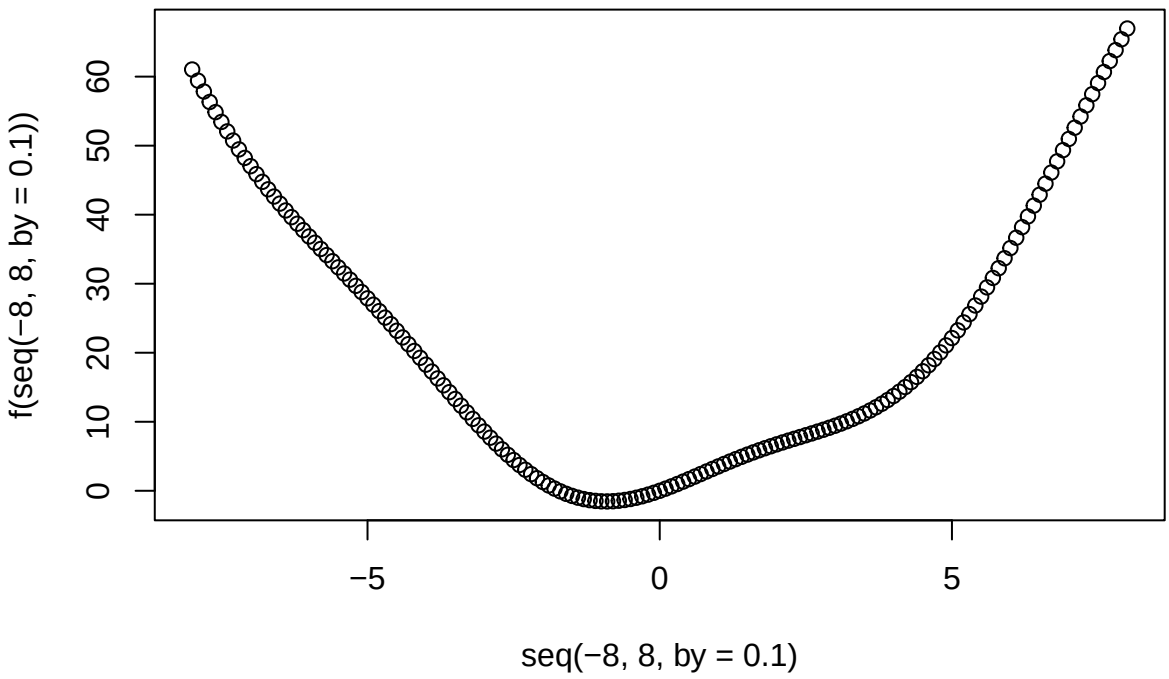
2022-10-18

Contents

Question 1

a

```
f <- function(x) x^2 + 3 * sin(x)
plot(x = seq(-8,8, by = 0.1), y = f(seq(-8,8, by = 0.1)))
```



I see a curved, not optimized line.

b

```
optimize(f, c(-3,3))
```

```
## $minimum
```

```
## [1] -0.9148551
##
## $objective
## [1] -1.540463
```

The minimum is -0.915.

c

```
optimize(f, c(-3,3),maximum = T)
```

```
## $maximum
## [1] 2.999947
##
## $objective
## [1] 9.4232
```

The maximum is 2.999.

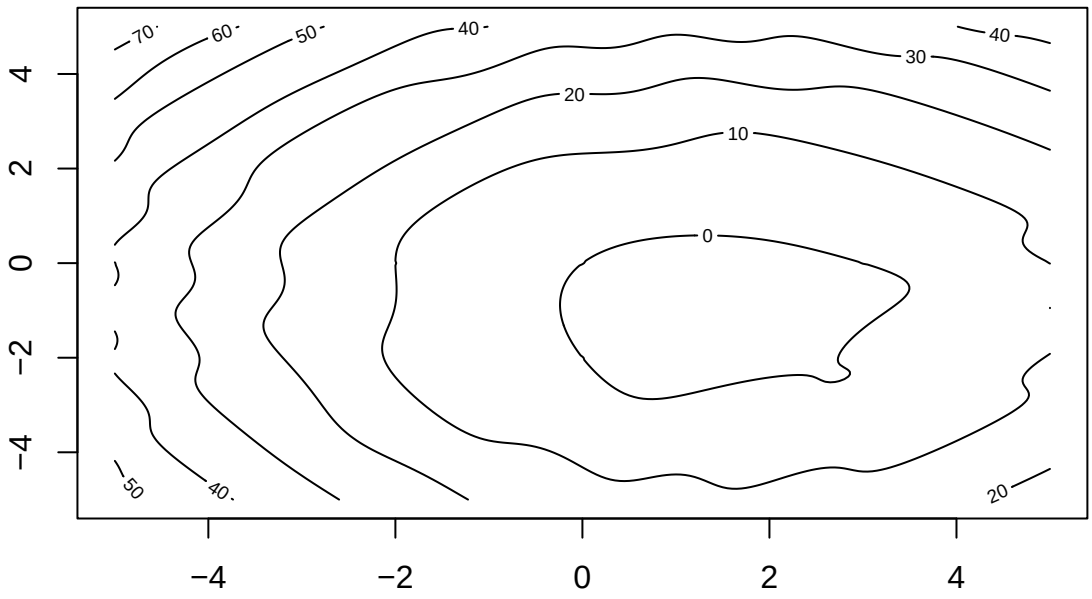
Question 2

a

f(x, y) = x2 + y2 - 3x + 2y + sin(xy)

```
fm <- function(x) x[1]^2 + x[2]^2 - 3 * x[1] + 2*x[2] + sin(x[1]*x[2])

x_min <- -5
x_max <- 5
y_min <- -5
y_max <- 5
x <- seq(-5, 5, by = 0.05)
y <- seq(-5, 5, by = 0.05)
z <- matrix(nrow=length(x), ncol=length(y))
for(i in 1:length(x)){
  for(j in 1:length(y)){
    z[i,j] <- fm(c(x[i],y[j]))
  }
}
contour(x,y,z)
```



The minimum occurs around x = 2, y = -2.

b

```
optim(c(-5,5),fm)
```

```
## $par
## [1]  1.513134 -1.020135
##
## $value
## [1] -4.249052
##
## $counts
## function gradient
##       61       NA
##
## $convergence
## [1] 0
##
## $message
## NULL
```

With the optim function we find the minimum value is -4.249, occurs at x = 1.513, y = -1.02.