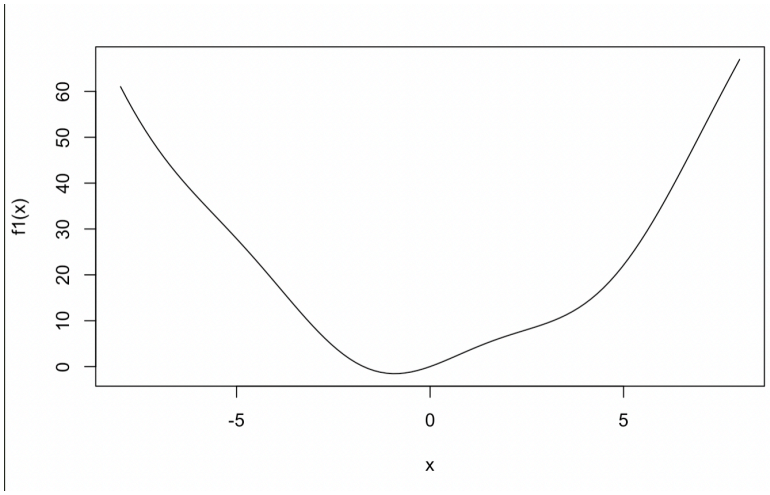
In-Class Assignment 12

1. Take the function $f(x) = x^2 + 3\sin(x)$.

    a. Graph the function between -8 and 8. What do you see about minimum and maximum values?

```
1. f1 <-
   function(x){
2.   return(x^2 +
   3*sin(x))
3. }
4.
5. curve(f1, from
   = -8, to = 8)
```



    b. Use the optimize function to find a minimum value in the interval [-3, 3].

        i. optimize(f1, lower = -3, upper = 3)

    c. Use the optimize function to find a maximum value in the interval [-3, 3].

        i. optimize(f1, upper = 3, lower = -3, maximum = TRUE)

        ii.

2. Take the function $f(x, y) = x^2 + y^2 - 3x + 2y + \sin(xy)$

    a. Produce a contour plot for the function in the square [-5, 5] x [-5, 5]. Where do you see a minimum or maximum value?

        i. #3-d plot of z = x^2 + y^2 - 3x

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

        iii. x_min <- -5

        iv. x_max <- 5

        v. y_min <- -5

        vi. y_max <- 5

        vii. x <- seq(-5, 5, by = 0.05)

viii.y <- seq(-5, 5, by = 0.05)

ix. z <- matrix(nrow=length(x), ncol=length(y))

x. for(i in 1:length(x)){

xi. for(j in 1:length(y)){

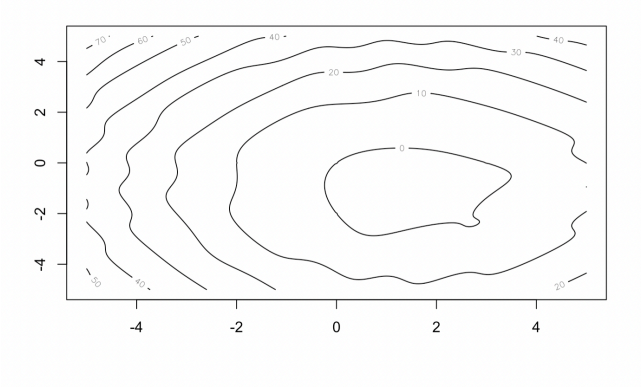
xii. z[i,j] <- fm(c(x[i],y[j]))

xiii. }

xiv.}

xv. contour(x,y,z)

xvi.max value i see is top left, (-4,4) min is (2,0)



b. Use the optim function to find the minimum value in this square.

i. # Multi-variable optimization

ii. optim(c(-5,5),fm)

1. $par
2. [1] 1.513134 -1.020135
3.
4. $value
5. [1] -4.249052
6.
7. $counts

8. function gradient
9. 61 NA
10.
11. $convergence
12. [1] 0
13.
14. $message
15. NULL