

Particle Swarm Optimizer

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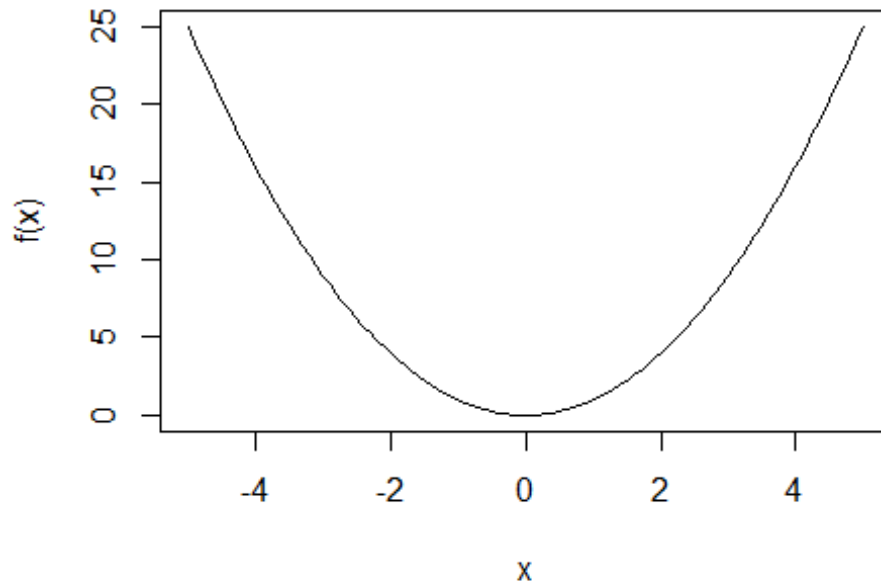
April 11, 2019

Trying out 2D first

```
set.seed(123)
#Simple function

f <- function(x){
  return(x^2)
}

curve(f(x), -5, 5)
```



```
swarm <- function(S, lower, upper, omega, phiP, phiG){
  best_swarm <- lower
  #particle positions
  x <- rep(0, S)
  #particle best positions
  p <- rep(0, S)
  #particle velocities
  v <- rep(0, S)
```

```

#for each particle i
for (i in 1:S){
  #initial position
  x[i] <- runif(1,lower,upper)
  p[i] <- x[i]

  if(f(p[i]) < f(best_swarm)){
    best_swarm <- p[i]
  }

  #initial velocity
  v[i] <- runif(1,-abs(upper-lower),abs(upper-lower))
}
#print(x)
#print(p)
#print(v)
#print(best_swarm)
for(j in 1:100){

  for (i in 1:S){
    rp <- runif(1,0,1)
    rg <- runif(1,0,1)

    v[i] <- omega*v[i] + phiP*rp*(p[i]-x[i]) + phiG*rg*(best_swarm-x[i])

    x[i] <- x[i] + v[i]

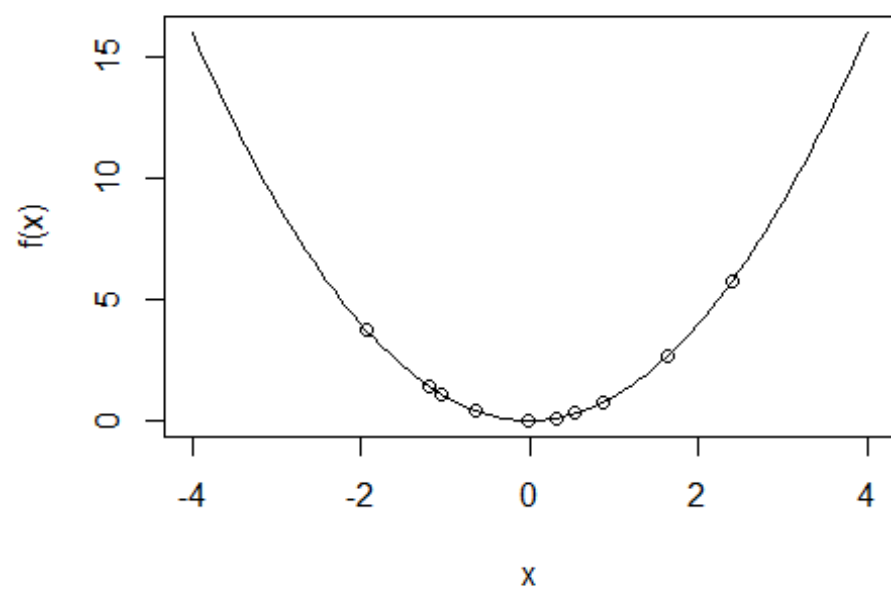
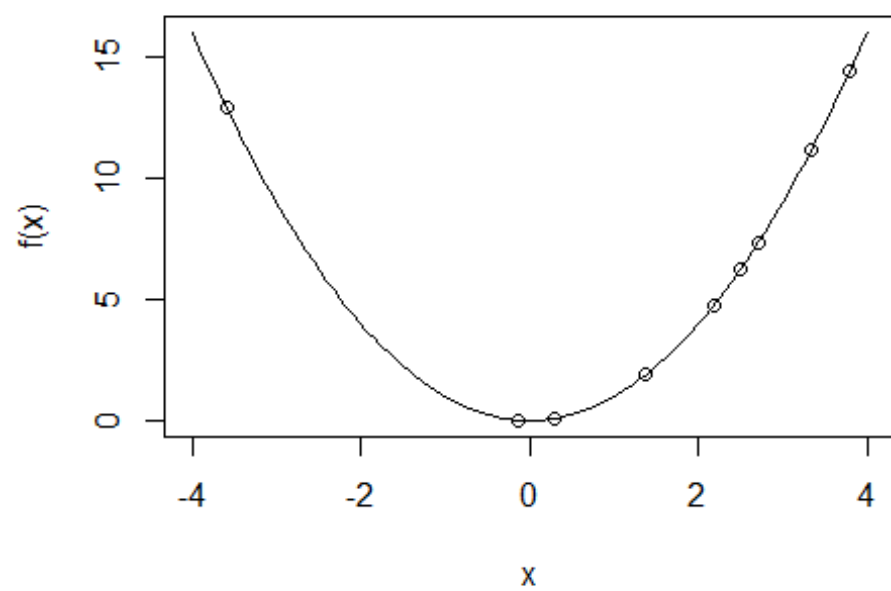
    if (f(x[i]) < f(p[i])){
      p[i] <- x[i]

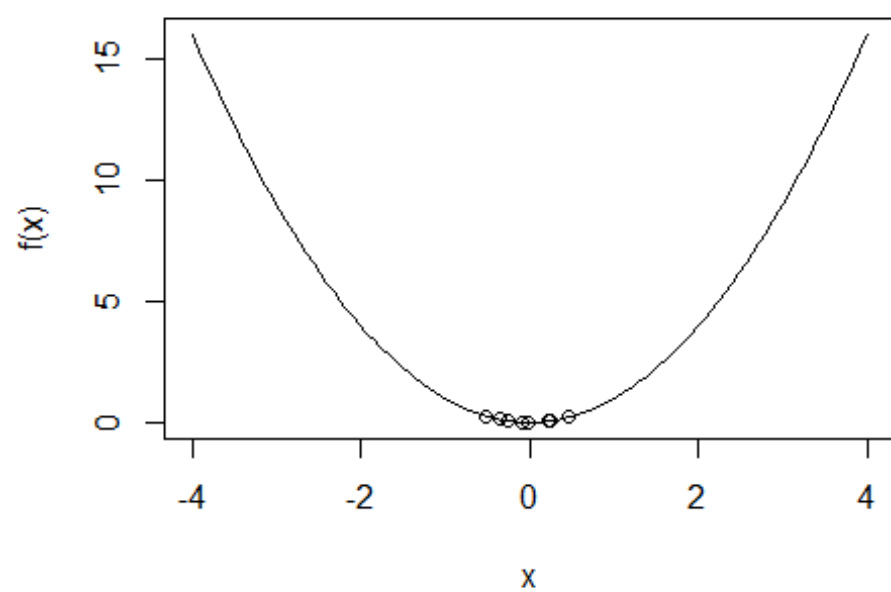
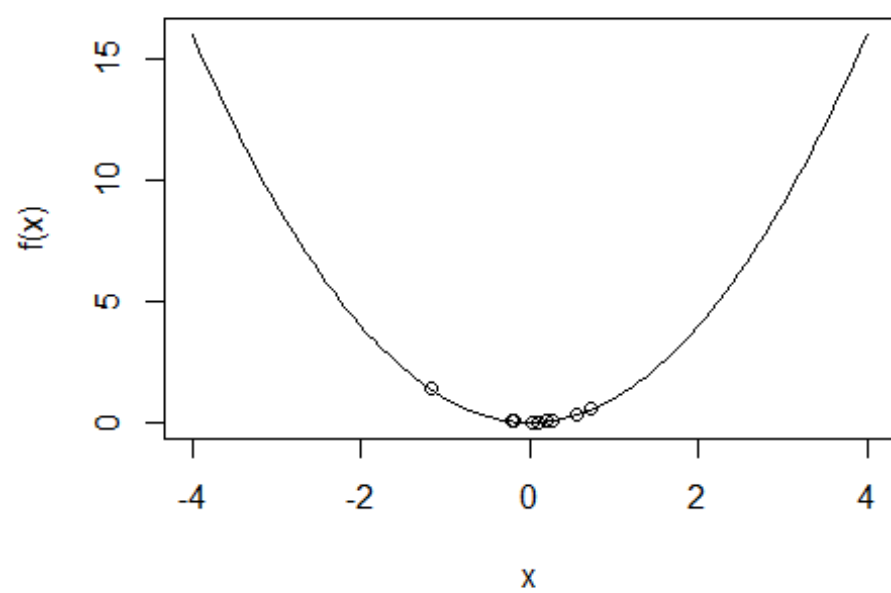
      #update best position in the swarm
      if (f(p[i]) < f(best_swarm)){
        best_swarm <- p[i]
      }
    }
  }
  if(j%%2 == 0 && j < 20){
    curve(f,lower,upper)
    points(x,f(x))
  }

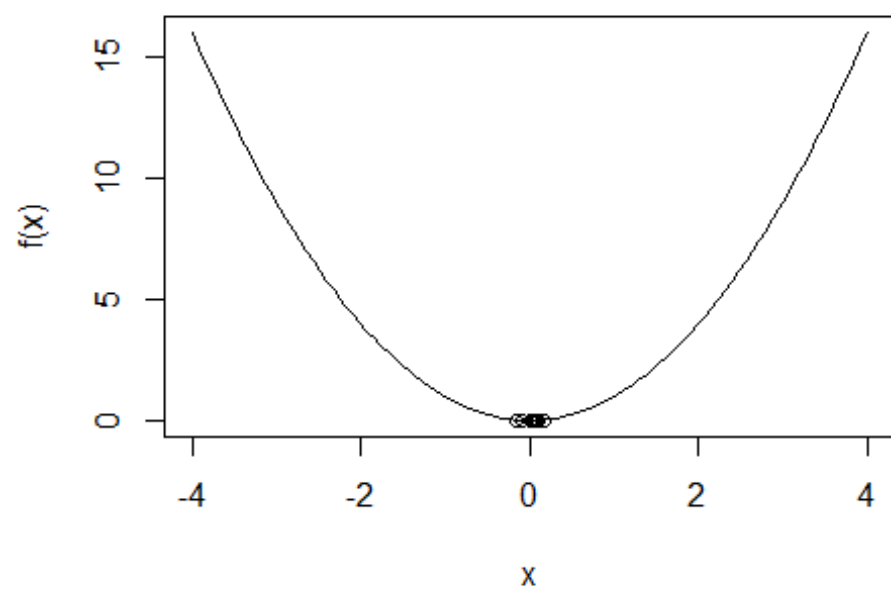
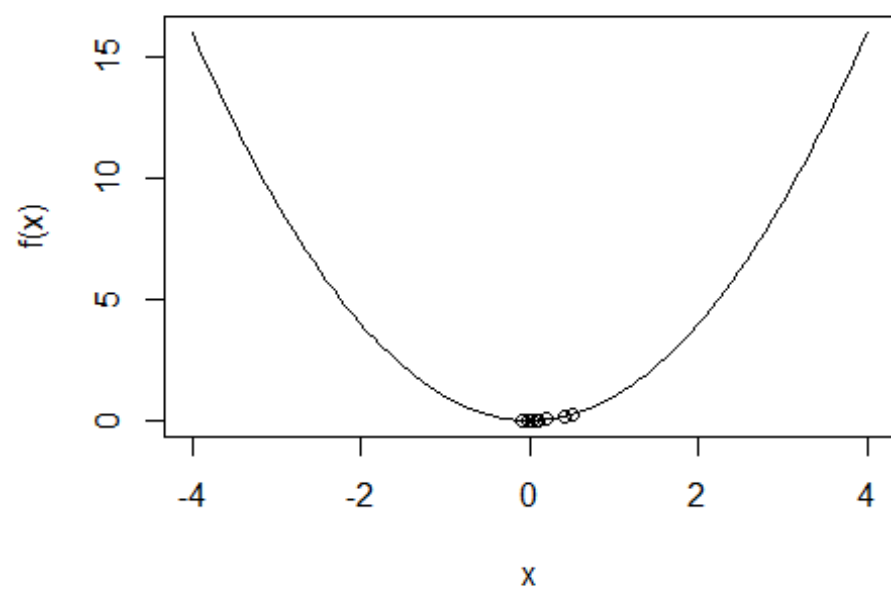
}
cat("best x value: ",best_swarm,"\n")
cat("minimum: ",f(best_swarm),"\n")
cat("\n")
}

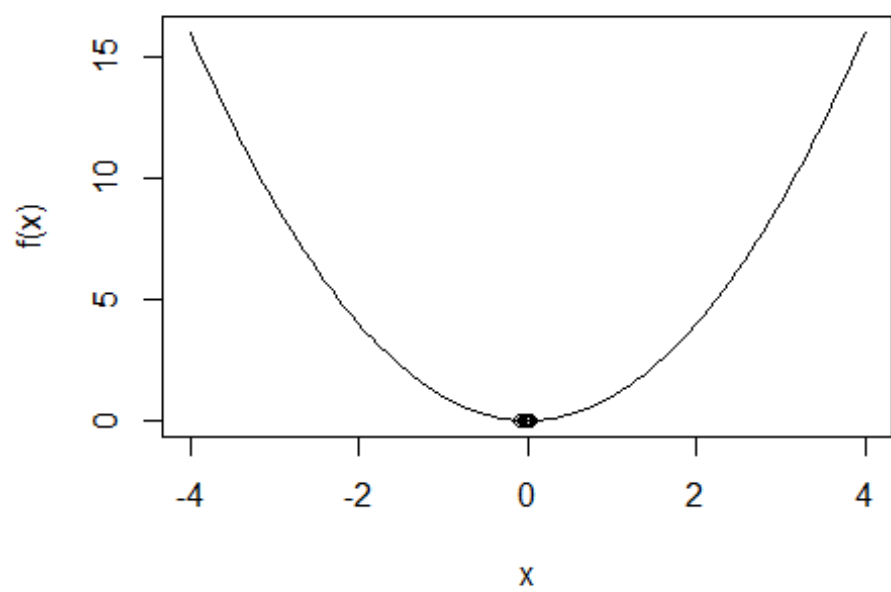
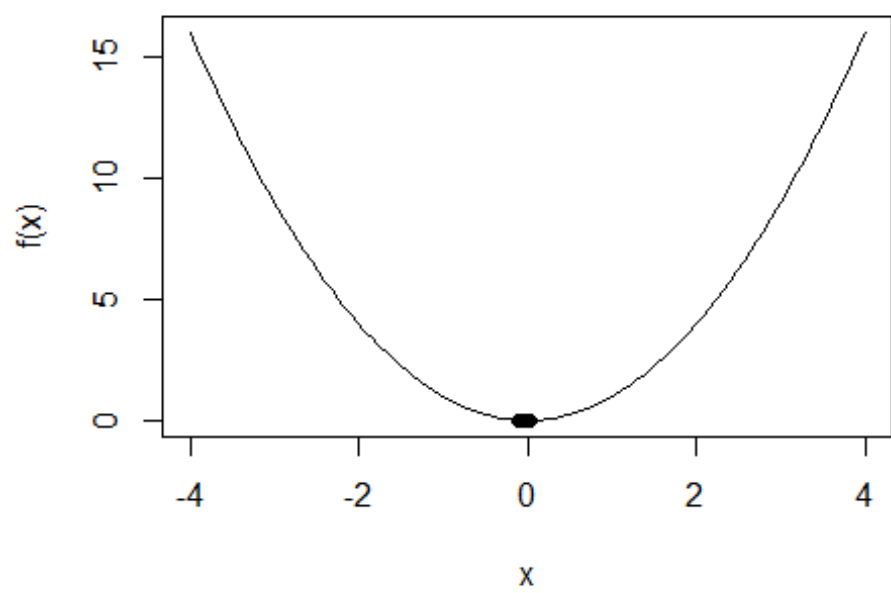
swarm(10,-4,4,.5,.5,.5)

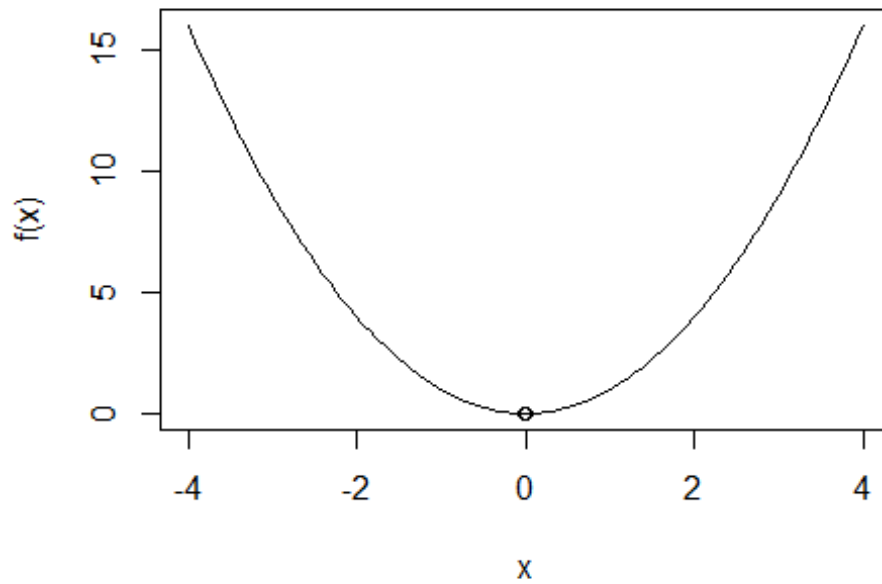
```











```
## best x value: -8.493187e-17
```

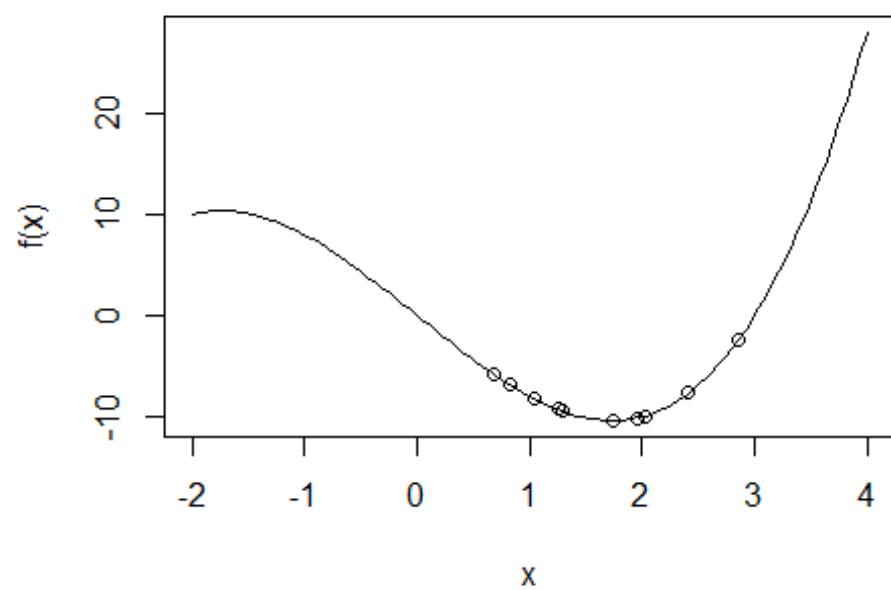
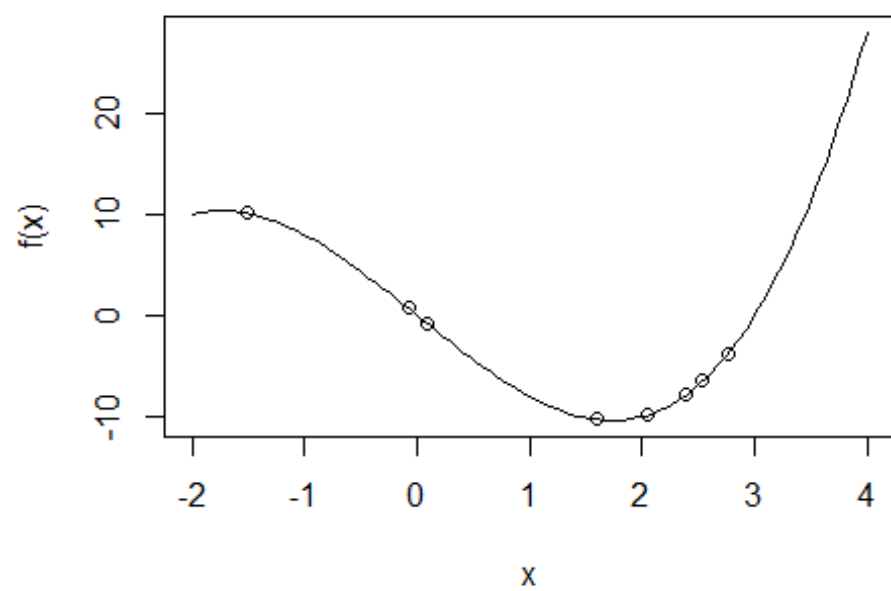
```
## minimum: 7.213423e-33
```

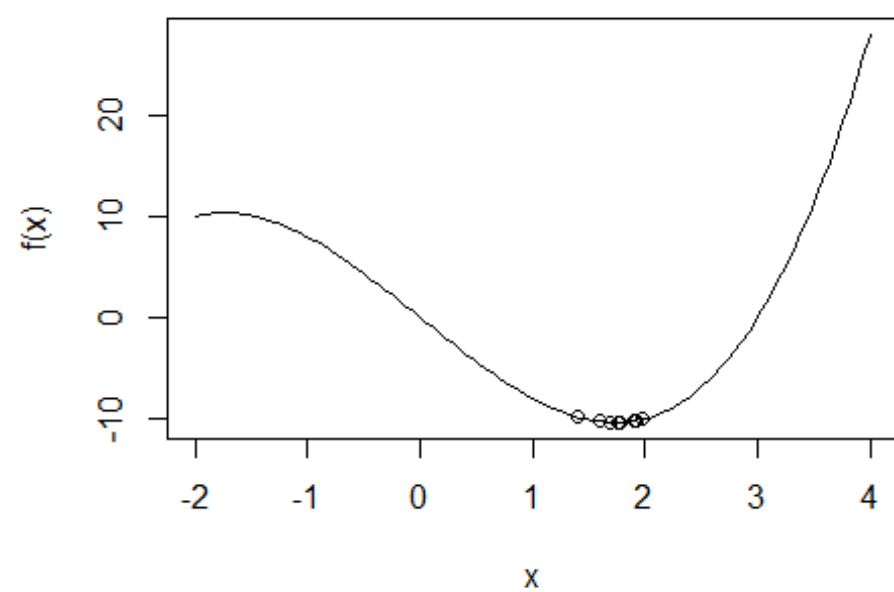
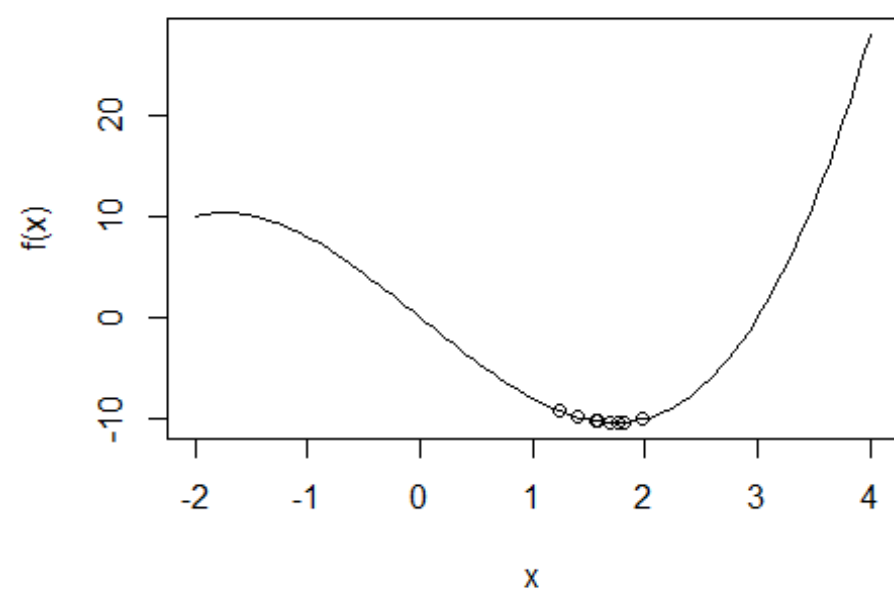
```
#more complex function
```

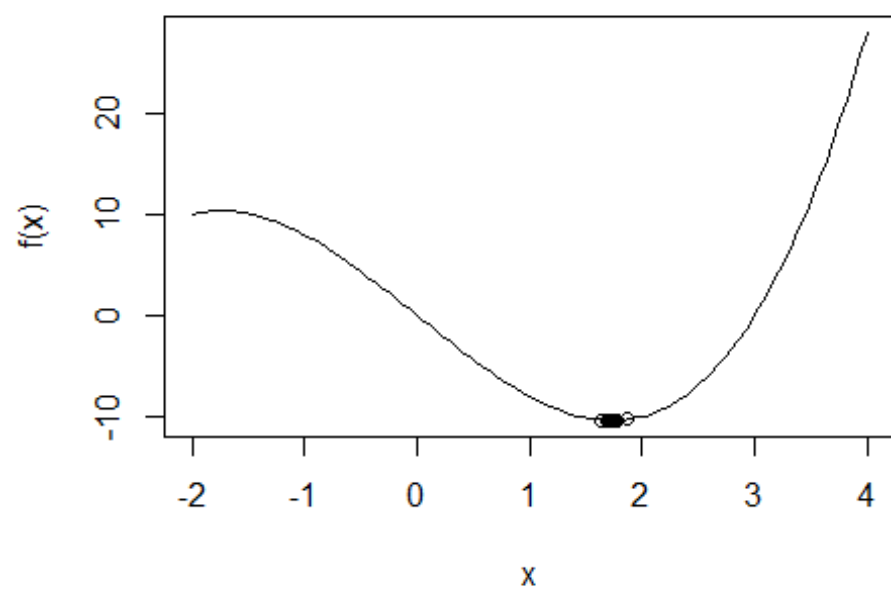
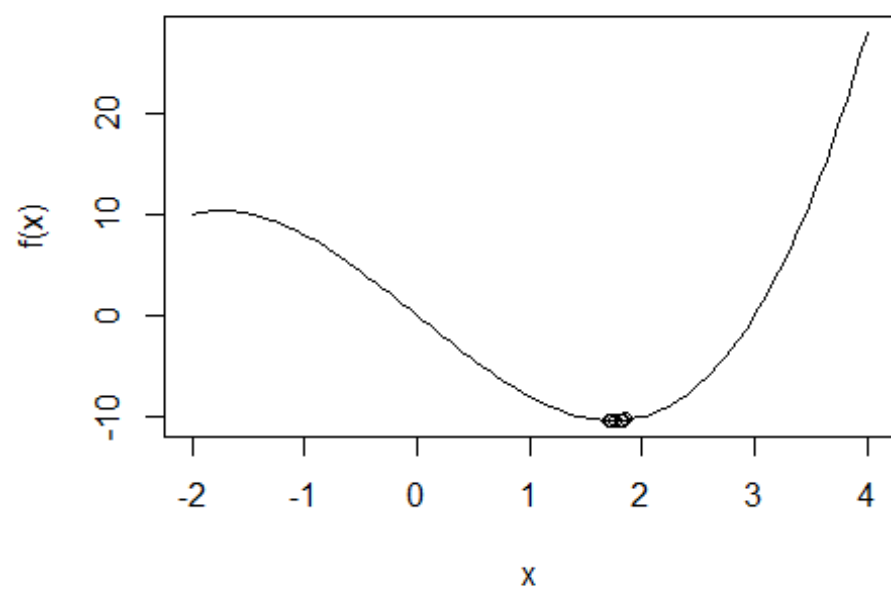
```
f <- function(x){  
  return(x^3 - 9*x)  
}
```

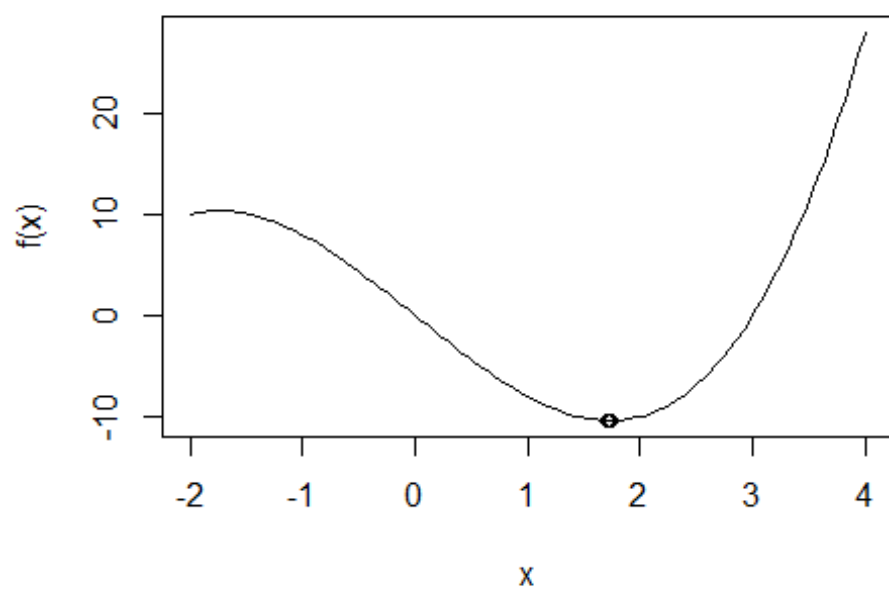
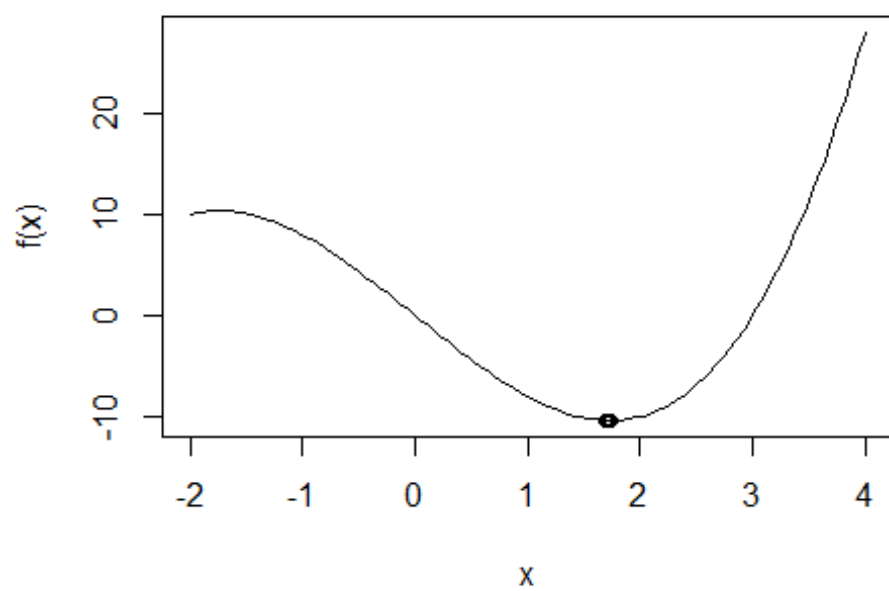
```
curve(f, -2, 4)
```

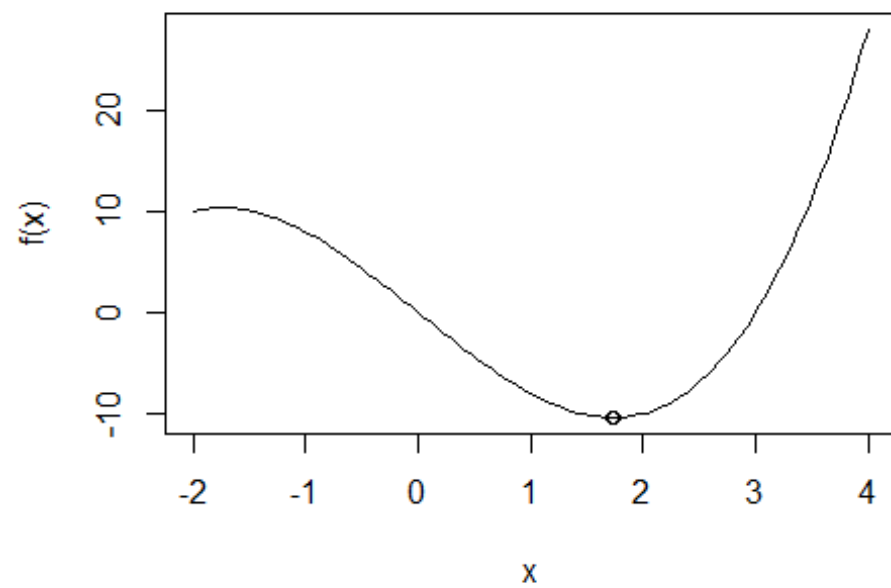
```
swarm(10, -2, 4, .5, .5, .5)
```











```
## best x value: 1.732051
## minimum: -10.3923
```