

102BHW6

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Q1

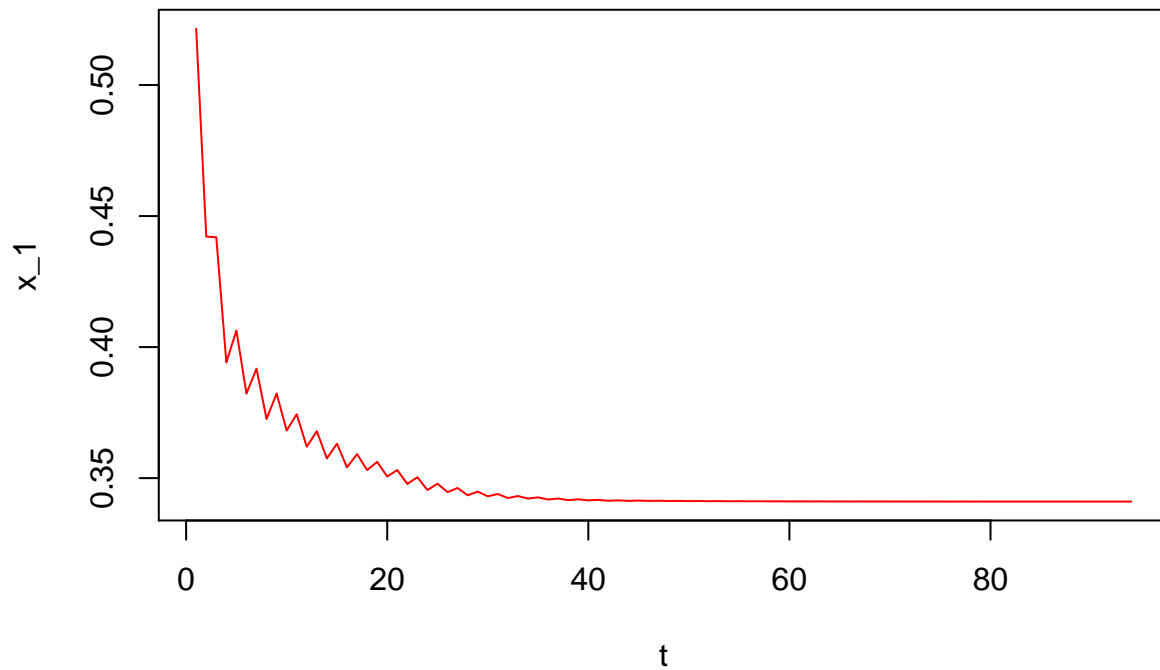
```
fun = function(x)
{
  return(2*x[1]^4+3*x[1]^3+2*x[1]^2+x[2]^2-4*x[1]*x[2])
}
gradient = function(x)
{
  return(c(8*x[1]^3+9*x[1]^2+4*x[1]-4*x[2], 2*x[2]-4*x[1]))
}
hessian = function(x)
{
  return(matrix(c(24*x[1]^2+18*x[1]+4,-4,-4,2),nrow=2))
}
alpha = 0.4
beta = 0.8
x=c(1,1)
e= 1e-5
result = c()
grad = gradient(x)
while(sqrt(sum(grad^2))>e) {
  grad = gradient(x)
  delta = -grad
  gamma = 1
  while(fun(x+gamma*delta) > fun(x) + alpha*gamma*sum(grad*delta))
  {
    gamma = gamma*beta
  }
  x= x+gamma*delta
  result = cbind(result,x)
}
x
```

```
## [1] 0.3410542 0.6821124
```

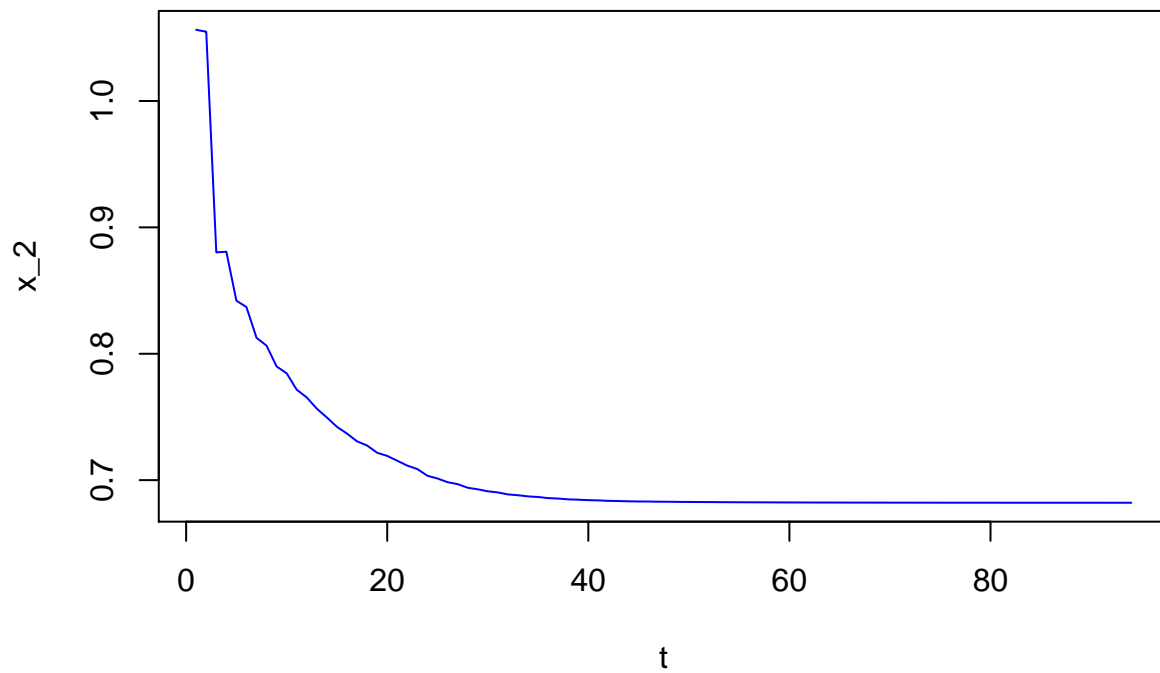
```
hessian
```

```
## function(x)
## {
##   return(matrix(c(24*x[1]^2+18*x[1]+4,-4,-4,2),nrow=2))
## }
```

```
plot(1:dim(result)[2], result[1,], xlab="t", type="l", ylab="x_1", col="red")
```



```
plot(1:dim(result)[2], result[2,], xlab="t", type="l", ylab="x_2", col="blue")
```



Q2

```
gradient2 = function(t)
{
  return(125/(2+t)+38/(t-1)+34/t)
}
hessian2 = function(t)
{
  return(-125/(2+t)^2 - 38/(t-1)^2 - 34/t^2)
}
```

```

pre_theta = 0
cur_theta = 0.2
e=1e-5
result2 = c()
while(abs(pre_theta - cur_theta) > e)
{
pre_theta = cur_theta
cur_theta = pre_theta - gradient2(pre_theta) / hessian2(pre_theta)
result2 = c(result2, cur_theta)
}
cur_theta

```

```
## [1] 0.6268215
```

```
plot(1:length(result2),result2,xlab="t",ylab = "theta",type="l")
```

