Homework4

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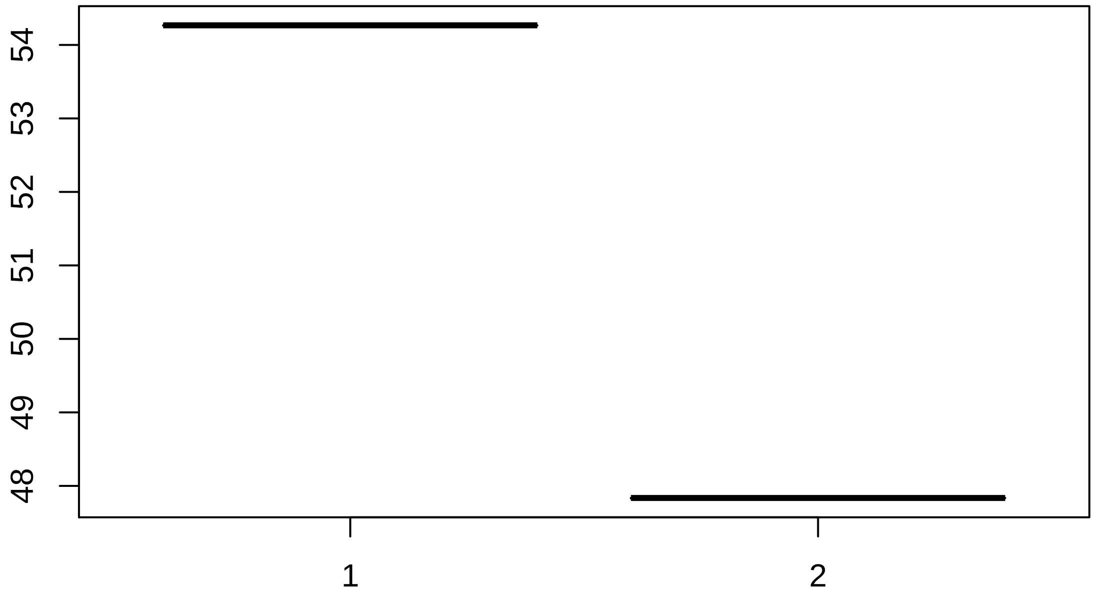
Problem 6

```
TTT=function(A){
  mean1=mean(A[,1])
  mean2=mean(A[,2])
  sd1=sd(A[,1])
  sd2=sd(A[,2])
  corr=cor(A[,1],A[,2])
  Mean=c(mean1,mean2)
  SD=c(sd1,sd2)
  T0=data.frame(Mean,SD,corr,row.names = c('dev1','dev2'))
  return(T0)
}
A=readRDS("HW4_data.rds")
Mean1=rep(0,13)
Mean2=rep(0,13)
Sd1=rep(0,13)
Sd2=rep(0,13)
for(i in 1:13){
  B=A[((142*i-141):(142*i)),-1]
  C=TTT(B)
  Mean1[i]=C[1,1]
  Mean2[i]=C[2,1]
  Sd1[i]=C[1,2]
  Sd2[i]=C[2,2]
  print(C)
}
```

```
##          Mean       SD        corr
## dev1 54.26327 16.76514 -0.06447185
## dev2 47.83225 26.93540 -0.06447185
##          Mean       SD        corr
## dev1 54.26610 16.76982 -0.06412835
## dev2 47.83472 26.93974 -0.06412835
##          Mean       SD        corr
## dev1 54.26144 16.76590 -0.06171484
## dev2 47.83025 26.93988 -0.06171484
##          Mean       SD        corr
## dev1 54.26993 16.76996 -0.06944557
## dev2 47.83699 26.93768 -0.06944557
##          Mean       SD        corr
## dev1 54.26015 16.76996 -0.06558334
## dev2 47.83972 26.93000 -0.06558334
##          Mean       SD       corr
## dev1 54.26734 16.76896 -0.0629611
## dev2 47.83955 26.93027 -0.0629611
##          Mean      SD        corr
## dev1 54.26881 16.7667 -0.06850422
## dev2 47.83545 26.9400 -0.06850422
##           Mean       SD        corr
## dev1 54.26030 16.76774 -0.06034144
## dev2 47.83983 26.93019 -0.06034144
##           Mean       SD        corr
## dev1 54.26732 16.76001 -0.06834336
## dev2 47.83772 26.93004 -0.06834336
##           Mean       SD        corr
## dev1 54.26873 16.76924 -0.06858639
## dev2 47.83082 26.93573 -0.06858639
##           Mean       SD        corr
## dev1 54.26588 16.76885 -0.06860921
## dev2 47.83150 26.93861 -0.06860921
##           Mean       SD        corr
## dev1 54.26785 16.76676 -0.06897974
## dev2 47.83590 26.93610 -0.06897974
##           Mean      SD        corr
## dev1 54.26692 16.7700 -0.06657523
## dev2 47.83160 26.9379 -0.06657523
```

```r
boxplot(Mean1,Mean2)
```



Problem 7

The analytic solution is:

```r
I=sqrt(2*pi)*(pnorm(1)-pnorm(0))
I
```

```
## [1] 0.8556244
```

For the numerical methods:

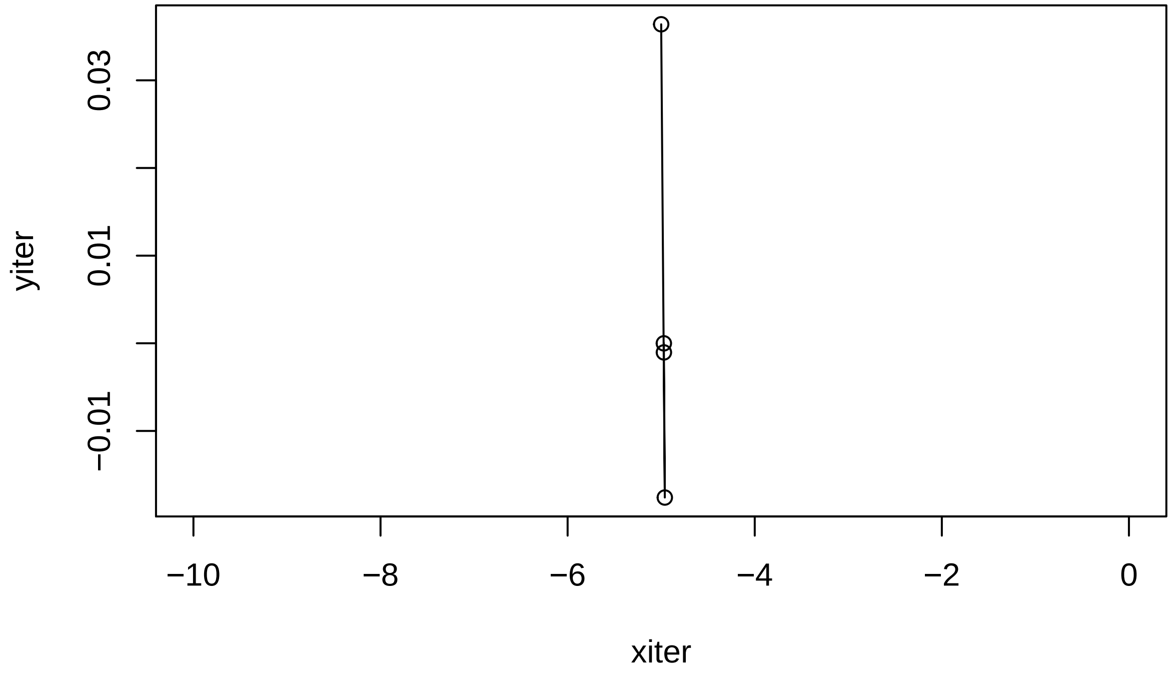
```
f=function(x){
  y=exp(-x^2/2)
  return(y)
}
Riemann=function(w){
  x=seq(from=0,to=1,by=w)
  y=0*x
  for(i in 1:length(x)){
    y[i]=f(x[i])*w
  }
  S=sum(y)
  return(S)
}
A=matrix(0,6,3)
A[,1]=.1^(1:6)
for(i in 1:6){
  A[i,2]=Riemann(10^(-i))
  A[i,3]=abs(I-A[i,2])
}
A
```

```
##       [,1]      [,2]         [,3]
## [1,] 1e-01 0.9354453 7.982092e-02
## [2,] 1e-02 0.8636520 8.027599e-03
## [3,] 1e-03 0.8564276 8.032148e-04
## [4,] 1e-04 0.8557047 8.032603e-05
## [5,] 1e-05 0.8556324 8.032648e-06
## [6,] 1e-06 0.8556252 8.032653e-07
```

Problem 8

```
f=function(x){
  y=3^x-sin(x)+cos(5*x)
  return(y)
}
g=function(x){
  y=log(3)*3^x-cos(x)-5*sin(5*x)
  return(y)
}
Newton=function(interval,tol){
  a=interval[1]
  b=interval[2]
  k=1
  x=(a+b)/2
  while(abs(f(x))>tol){
    z=x-f(x)/g(x)
    x=z
    if(b-x>0 & x-a>0){
      k=k+1
    }else{
      break
    }
```

```r
  }
  xiter=rep(0,k+1)
  yiter=rep(0,k+1)
  xiter[1]=(a+b)/2
  yiter[1]=f((a+b)/2)
  for(i in 2:(k+1)){
    s=xiter[i-1]
    t=s-f(s)/g(s)
    xiter[i]=t
    yiter[i]=f(t)
  }
  xiter=xiter[1:k]
  yiter=yiter[1:k]
  if(abs(yiter[k])<=tol){
    plot(xiter,yiter,xlim = c(a,b),type = 'o')
    return(xiter[k])
  }else{
    return('Root Not Found')
  }
}
Newton(c(-10,0),0.0005)
```



```
## [1] -4.971505
```