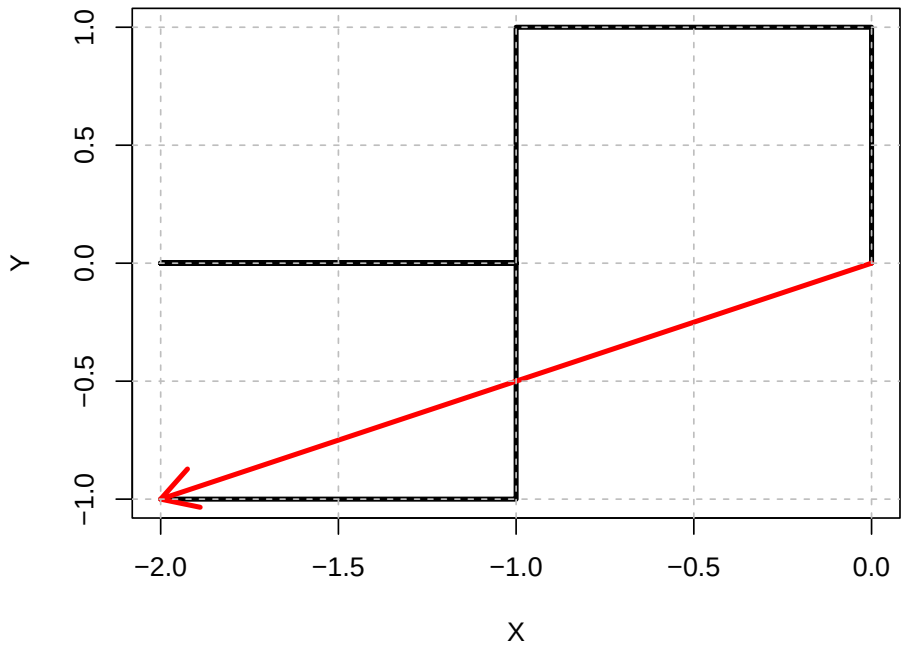
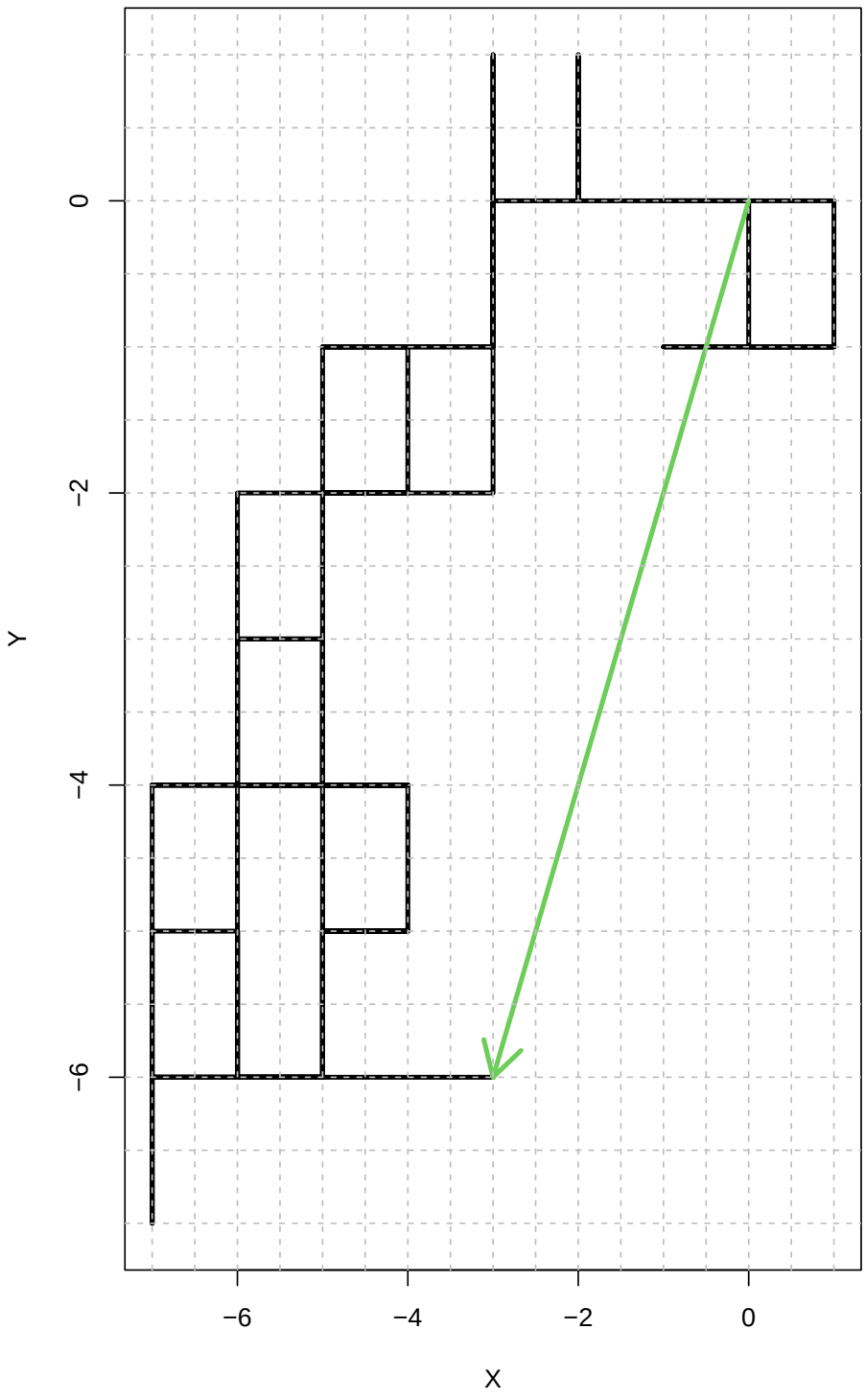
NAME: Arya Biswas
Apple Bread
a)

```
> library(tidyverse)
> library(viridis)
> X=0
> Y=0
> P=sample(c(0,1),10,replace=TRUE)
> for(i in 2:10){
+   if(P[i]==0){
+     d=sample(c(-1,1),1,replace=TRUE)
+     X[i]=X[i-1]+d
+     Y[i]=Y[i-1]
+   }
+   else{
+     d=sample(c(-1,1),1,replace=TRUE)
+     Y[i]=Y[i-1]+d
+     X[i]=X[i-1]
+   }
+
+ }
> plot(X,Y,type="l",lwd="3")
> for(i in length(X))
+   arrows(X[1],Y[1],X[length(X)],Y[length(Y)],col="red",lwd="3")
> abline(h = seq(-10,10, by = 0.5), col = "gray", lty = 2)
> abline(v = seq(-10,10, by = 0.5), col = "gray", lty = 2)
```



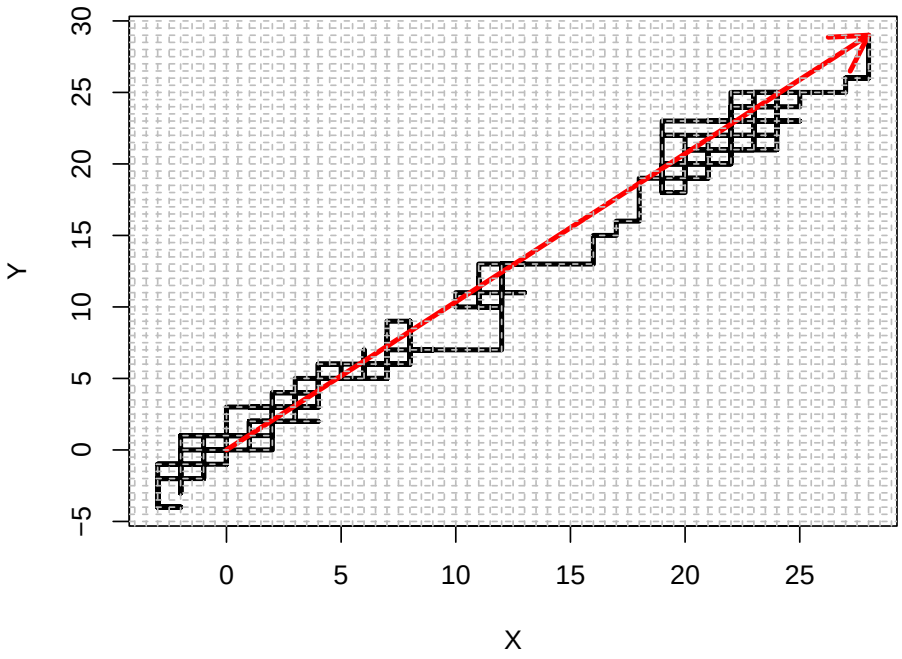
b)

```
> library(tidyverse)
> library(viridis)
> X=0
> Y=0
> P=sample(c(0,1),100,replace=TRUE)
> for(i in 2:100){
+   if(P[i]==0){
+     d=sample(c(-1,1),1,replace=TRUE)
+     X[i]=X[i-1]+d
+     Y[i]=Y[i-1]
+   }
+   else{
+     d=sample(c(-1,1),1,replace=TRUE)
+     Y[i]=Y[i-1]+d
+     X[i]=X[i-1]
+   }
+ }
> plot(X,Y,type="l",lwd="3")
> for(i in 1:100)
+   arrows(X[i],Y[i],X[i+1],Y[i+1],col=sample(viridis(100),1),lwd="2")
> abline(h = seq(-100,100, by = 0.5), col = "gray", lty = 2)
> abline(v = seq(-100,100, by = 0.5), col = "gray", lty = 2)
```



c.

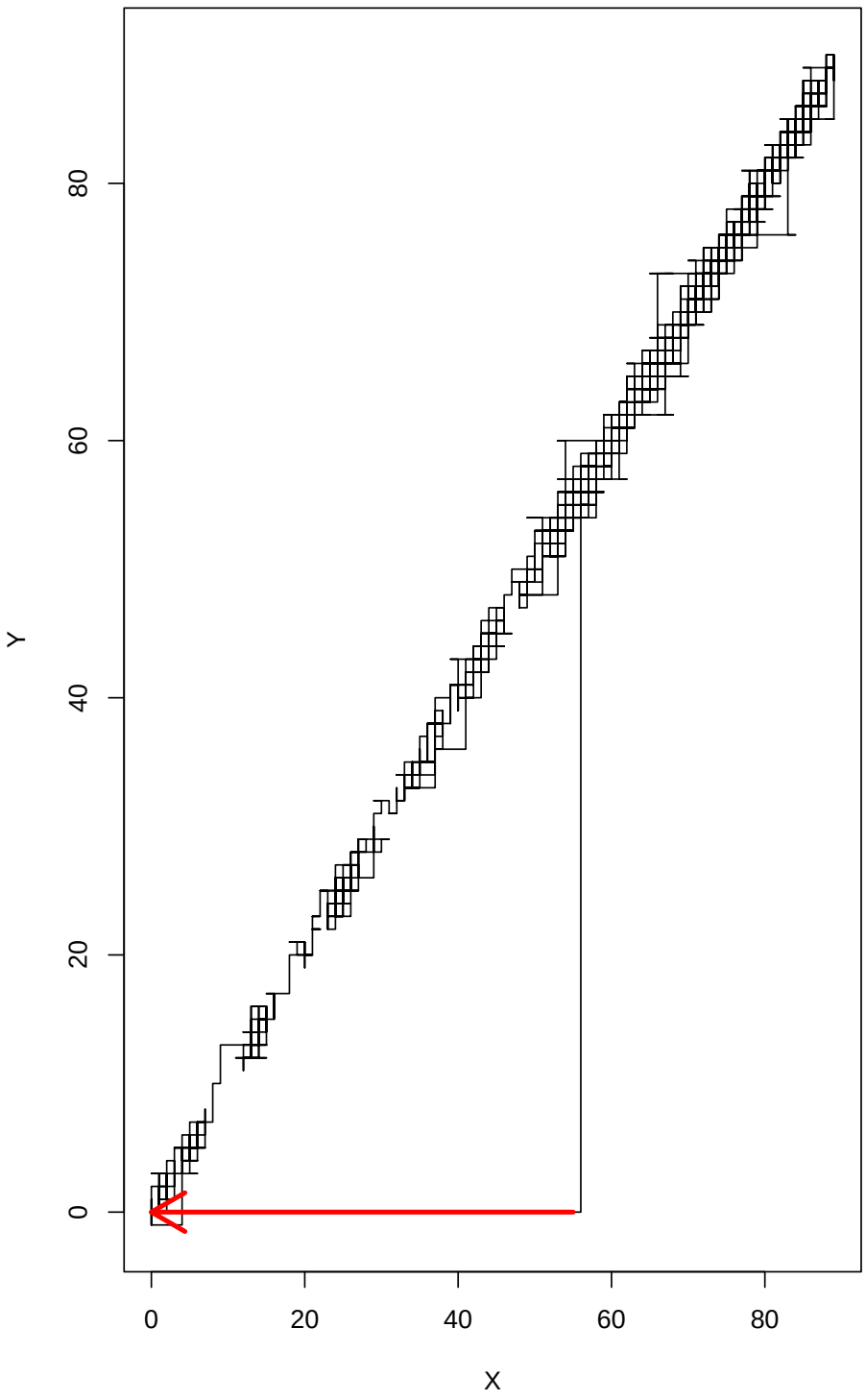
```
> X=0
> Y=0
> Xn=0
> Yn=0
> P=sample(c(0,1),10,replace=TRUE)
> while(abs(Xn)+abs(Yn)<55){
+ P=sample(c(0,1),1,replace=TRUE)
+     if(P==0){
+         d=sample(c(-1,1),1,replace=TRUE)
+         Xn=X[length(X)]+d
+         X=c(X, Xn)
+         Yn=Y[length(Y)]
+         Y=c(Y, Yn)
+     }
+     else{
+         d=sample(c(-1,1),1,replace=TRUE)
+        Yn=X[length(Y)]+d
+         Y=c(Y, Yn)
+         Xn=X[length(X)]
+         X=c(X, Xn)
+    }
+ }
> plot(X,Y,type="l",lwd="3")
> for(i in length(X))
+   arrows(X[1],Y[1],X[length(X)],Y[length(Y)],col="red",lwd="3")
> abline(h = seq(-55, 55, by = 0.5), col = "gray", lty = 2)
> abline(v = seq(-55, 55, by = 0.5), col = "gray", lty = 2)
```



d.

```
> X=55
> Y=0
> Xn=0
> Yn=0
> while(T){
+ P=sample(c(0,1),1,replace=TRUE)
+     if(P==0){
+         d=sample(c(-1,1),1,replace=TRUE)
+         Xn=X[length(X)]+d
+         X=c(X, Xn)
+         Yn=Y[length(Y)]
+         Y=c(Y, Yn)
+     }
+     else{
+         d=sample(c(-1,1),1,replace=TRUE)
+        Yn=X[length(Y)]+d
+         Y=c(Y, Yn)
+         Xn=X[length(X)]
+         X=c(X, Xn)
+     }
+ if(Xn==0 & Yn==0){
+   break
+ }
```

```
+ }
> plot(X,Y,type="l")
> for(i in length(X))
+   arrows(X[1],Y[1],X[length(X)],Y[length(Y)],col="red",lwd="3")
```


Y
0
20
40
60
80
0
20
40
60
80
X