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STATS 202A

Fall 2014

Homework 3

Output:

Figure 1: A plot of alt2(n) versus n, for n ranging up to 1 million.

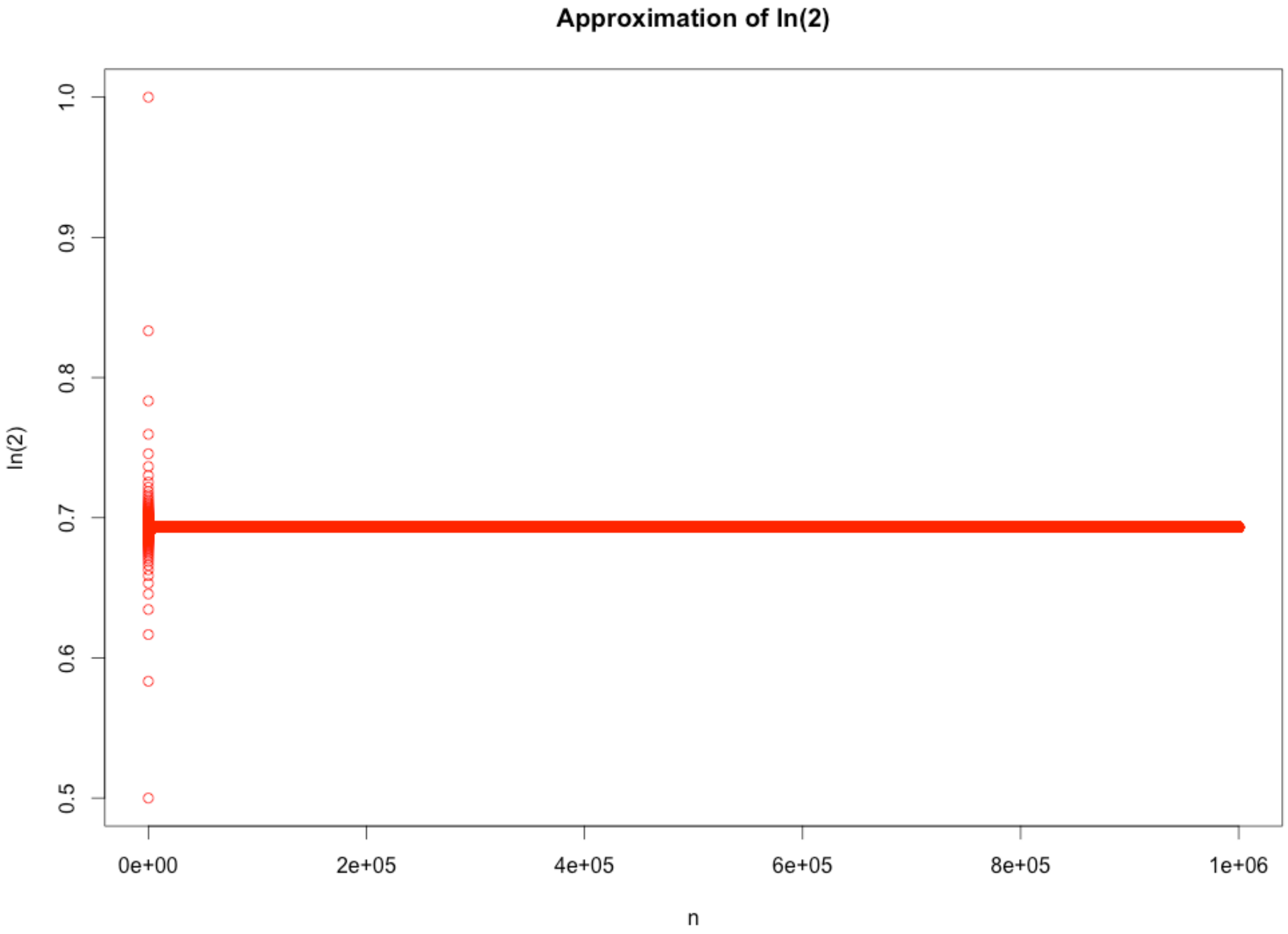
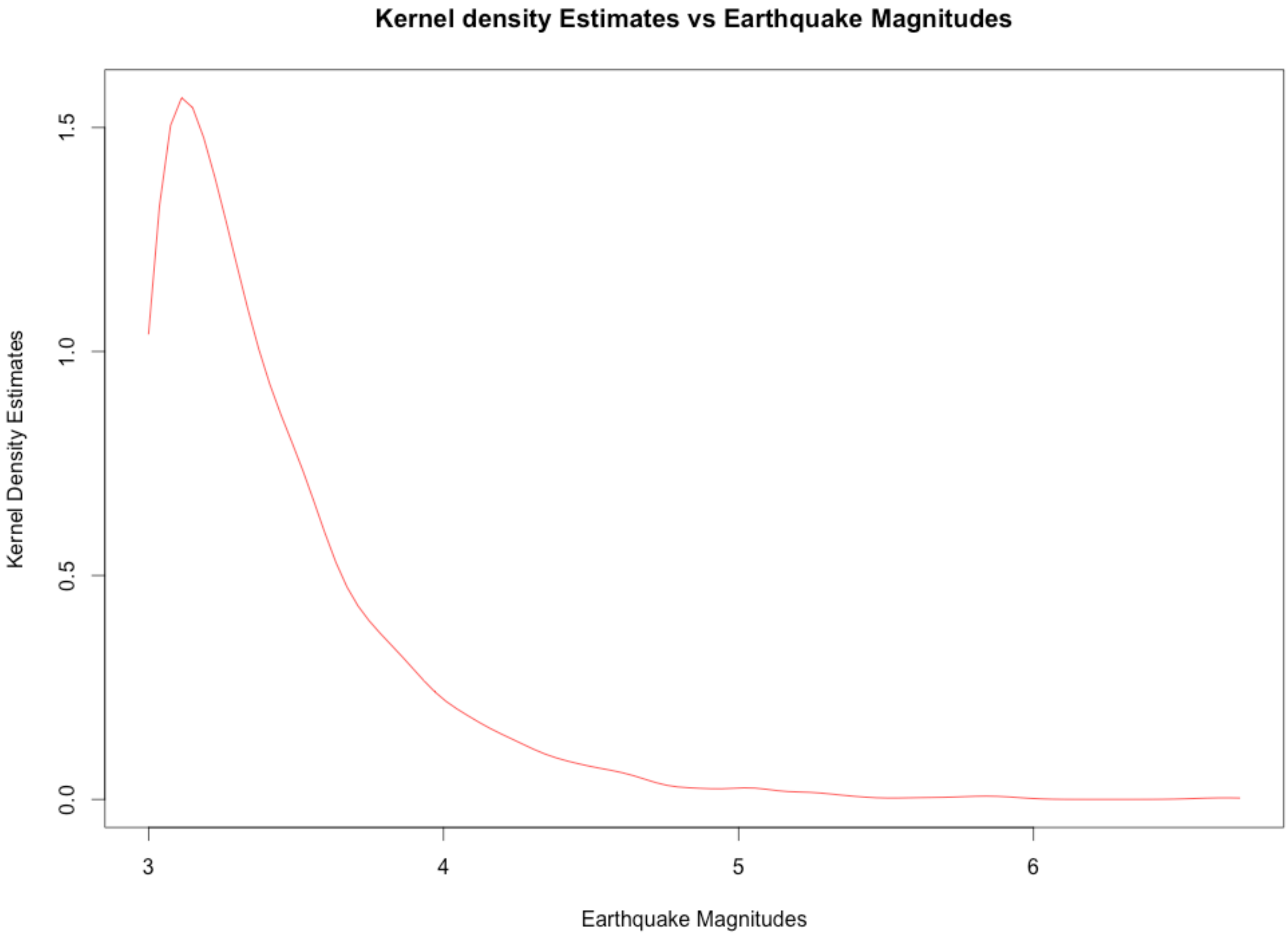


Figure 2: A plot of your kernel density estimates fˆ (m1), fˆ (m2), ..., fˆ (m100) versus m.



Code:

```
#include <R.h>
#include <Rmath.h>

//Question 1:
//===========
void alt2 (int *num, double *output) {
  output[0] = 1.0;
      for(int i=1; i<*num; i++) {
    if(i%2 != 0)
      output[i] = output[i-1] - 1.0/(i+1.0);
    else
      output[i] = output[i-1] + 1.0/(i + 1.0);
      }
}
```

```
//Question 2:
//===========
void kDensity (int *m, int *n, double *g, double *x, double *y, double *bw) {
  double a;
  for(int i=0; i<*m; i++) {
    a = 0.0;
    for(int j=0; j<*n; j++) {
      a += dnorm((x[j]-g[i]) / *bw, 0, 1, 0);
    }
    y[i] = a/(*n * *bw);
  }
}
```

```
#Question 1:
#===========
system("R CMD SHLIB hw3.c")
dyn.load("hw3.so")

alt2 = function(n) {
      .C("alt2", as.integer(n), y = double(n))
}

result = alt2(1000000)
x = 1:1000000

plot(x,result$y,xlab="n",ylab="ln(2)",main="Approximation of ln(2)",col="red" )
```

```
#Question 2:
#===========
dataE = scan("SearchResults.txt", skip=3, nlines=2395, what="char")
dataMatrixE = matrix(dataE, ncol=12, byrow=T)
colNamesE = scan("SearchResults.txt", skip=2, nlines=1, what="char")
colnames(dataMatrixE) = colNamesE
mag_vec = as.numeric(as.vector(dataMatrixE[,'MAG']))


system("R CMD SHLIB hw3.c")
dyn.load("hw3.so")

kDensity = function(mag_vec) {
  bandwidth=bw.nrd(mag_vec)
  gridPoints = seq(min(mag_vec), max(mag_vec), length=100)
  m = length(gridPoints)
  n = length(mag_vec)
  .C("kDensity", as.integer(m), as.integer(n), g=as.double(gridPoints),
     as.double(mag_vec), y=double(m), as.double(bandwidth))
}

a = kDensity(mag_vec)
plot(a$g,a$y,type="l",xlab="Earthquake Magnitudes",ylab="Kernel Density
Estimates",col="red",main="Kernel density Estimates vs Earthquake Magnitudes”)
```