> #Part (a) True Value of the Integral

>

> #Defining the Function

> f<-function(x){exp((-x^2)/2)}

> #Integrating function from a=0 to b=1

> integrate(f, lower = 0, upper = 1)

0.8556244 with absolute error < 9.5e-15

> #True Value of integral for a=0, b=1: 0.856

>

> #Integrating function from a=0 to b=4

> integrate(f, lower = 0, upper = 4)

1.253235 with absolute error < 6.1e-12

> #True Value of integral for a=0, b=4: 1.253

>

>

> #Part (b) Computing an estimate via the Monte Carlo technique

>

> MC<-function(n,a,b){

+ U<-runif(n, a, b)

+ X<-exp((-U^2)/2)

+ MCI<-((b-a)/n)\*sum(X)

+ }

>

> ## a=0, b=1

> print(MC(20, 0, 1)) # n=20

[1] 0.8803181

> print(MC(200, 0, 1)) # n=200

[1] 0.8644341

> print(MC(2000, 0, 1)) # n=2000

[1] 0.856046

>

> ## a=0, b=4

> print(MC(20, 0, 4)) # n=20

[1] 1.072619

> print(MC(200, 0, 4)) # n=200

[1] 1.313557

> print(MC(2000, 0, 4)) # n=2000

[1] 1.258379

> #Part (c) (More of part C is in my handwritten copy.)

> #As the number of random sample points increased, the smaller the distance between the estimate and the true value. This is true for both combinations of a and b.