Joseph High
Hopkins ID: 9E1FDC

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> #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.
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