**Homework III** (Due Apr 15, 2021, 11:59pm)

1. “A Beginner’s Guide to R”中文版第二章习题6（p54）(3’)
2. “A Beginner’s Guide to R”中文版第三章习题2（p72）(8’)
3. “A Beginner’s Guide to R”中文版第三章习题3（p72）(1’)
4. Monte-Carlo Integration (6’)

Suppose we wish to estimate the integral as below using a Monte-Carlo method. Essentially, we throw darts at the curve and count the number of darts that fall below the curve.





Literally, the simulation process is like:

1. Initialize: hits = 0

2. **for *i* in 1:N**

Generate two random numbers, *U*1*, U*2, between 0 and 1

If *U*2 *< U*12

then hits = hits + 1

3. **end**

4. Area estimate = hits/N

Write an R function (monte\_carlo = function(*N*){}) to do the simulation. Let *N* = 500000.

It’s important to make full use of R functions that use vectors to save running time.

You can run the loop version (monte\_carlo) and vectorization version (monte\_carlo\_vec), then use **system.time**() to compare the running time.