

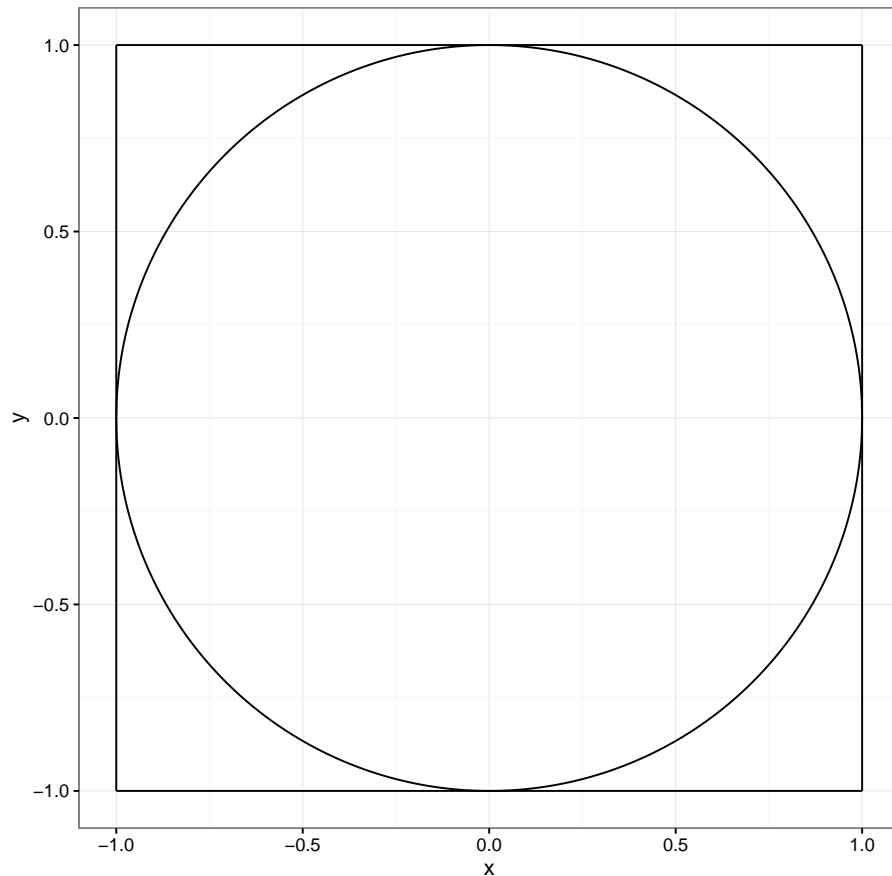
https://dicook.github.io/Statistical_Thinking/tutorials/lab11/lab11help.pdf

Remember SETU surveys!

Question One - Monte Carlo Approximations

Your tasks:

1. Sample coordinates from the unit square.
2. Decide if that point is inside the unit circle.
3. Count the number of times the point is inside the circle for $n \in \{100, 1000, 10000, 100000\}$.
4. Calculate your approximation for π .



Question Two - Accept/Reject sampling

Part A

1. Sample $x^{(i)}$ from the proposal distribution $g(x)$.
2. Calculate $\frac{f(x^{(i)})}{cg(x^{(i)})}$.
3. Sample u from $\mathcal{U}(0, 1)$.
4. Decide to accept or reject $x^{(i)}$.

Part B

1. For each c run the function 1000 times. Try replicate(1000, function).
2. Count the number of rejections.
3. Calculate $f(x)$ for a sequence of x between 0 and 1.
4. Plot the density of the accepted draws against a line plot of $(x, f(x))$.

Question Three - Metropolis Hastings MCMC

1. Pick an arbitrary starting value that could come from a Cauchy, which is a Students' t with one degree of freedom.
2. Generate a candidate draw from the proposal distribution.
3. Calculate $r(x, y)$.
4. Decide to keep the new draw or repeat the old draw.
5. Calculate the rejection rate.
6. Plot (1:n, draws) as a line plot.
7. Plot the draws as a density plot.