STA 3431 (Monte Carlo Methods), Fall 2021

Homework #3 Assignment: worth 18% of final course grade.

Due: On Quercus by 11:00 p.m. **sharp** (Toronto time) on Friday November 26.

NOTE: All of the GENERAL NOTES from HW#1 still apply.

THE ACTUAL ASSIGNMENT:

1. [6] Again let A, B, C, and D be the last four digits of your student number. Consider the standard variance components model described in lecture, with $K = 6$ and $J_i \equiv 5$, and $\{Y_{ij}\}$ the famous "dyestuff" data (from the file "Rdye"), and prior values $a_1 = 0.001/(5+A)$, $b_1 = 0.001/(5+B)$, $a_2 = 0.001/(5+C)$, $b_2 = 0.001/(5+D)$, and $a_3 = b_3 = 1600$.

Estimate (as best as you can, together with a discussion of accuracy etc.) the posterior mean of V/W using a full-dimensional Metropolis or Metropolis-Hastings algorithm.

[Hint: You may wish to work with $\log \pi$ instead of π. And, be sure to find some reasonable starting values so that $\pi(x_0)$ does not evaluate numerically to 0.]

2. [6] Repeat Question #1, but this time using a componentwise Metropolis or Metropolis-Hastings algorithm instead of full-dimensional. (Include some discussion of how this algorithm's performance compares to that of Question #1.)

3. [6] Repeat Question #1, but this time using a Gibbs sampler instead of Metropolis-Hastings (including first deriving from scratch all of the required conditional distributions, whether or not they were described in lecture). (Include some discussion of how this algorithm's performance compares to that of Questions #1 and #2.)

[Hint: If `X=rgamma(shape=a,rate=b)` in R, then $1/X \sim IG(a, b)$.]

[END; total points = 18]