MA 323 (2024) **Monte Carlo Simulation** **Lab 04**

Submission Deadline: August 22, 2024, 12:15 PM

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1. Use the Box-Muller method and Marsaglia and Bray method to do the following:

   (a) Generate a sample of 100 and 10000 values from $N(0, 1)$. Hence, find the sample mean and variance.

   (b) Keep a track of the computational time required for both the methods and both the cases, namely, 100 and 10000 sample sizes. Which method is faster?

   (c) For the Marsaglia and Bray method keep track of the proportion of values rejected for both the cases. How does it compare with $1 - \frac{\pi}{4}$?

   (d) Now plot histogram of generated random numbers for both the cases, namely, 100 and 10000 samples.

   (e) Now use the above generated values to generated samples from $N(0, 5)$ and $N(5, 5)$. Hence plot the density function from the formula and also plot histogram of generated sample in the same plot in both the cases. How do these two plots compare in both the cases?

2. Approximate the following integration using Monte Carlo technique:

$$\int_{-\infty}^{\infty} \frac{e^{-x^2}}{1 + |x|} dx.$$
