NERS544: (Introduction to) Monte Carlo Methods

Assignment 2: **Sampling** Fall 2016

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Due: Thursday Sept. 22, 2016 before class

The following problems are to be solved on paper. Computer verifications of the sampling methods developed are not necessary, although, that would be a sure way to see if your answer is correct.

Q2.1, 30% Form the cumulative probability distribution for the Cauchy distribution:

$$p(x) = \frac{1}{\pi}\frac{1}{1+x^2} \quad ; \quad -\infty < x < \infty.$$

Invert it to indicate how x would be determined from a random number.

Q2.2, 30% Form the cumulative probability distribution for the small-angle form of the Rutherfordian distribution:

$$p(x) = \frac{2x}{(x^2+1)^2} \quad ; \quad 0 \le x < \infty,$$

Invert it to indicate how x would be determined from a random number.

Q2.3, 40% Normalize

$$f(x,y) = \sin(x+y) \quad ; \quad 0 \le x < \frac{\pi}{2}, 0 \le y < \frac{\pi}{2}$$

converting it to a probability distribution. Develop a sampling technique by forming a marginal and a conditional probability distribution. You may use any combination of direct sampling or rejection sampling you wish.