- Report in maximum of 2 pages
- The total value of the assignment is 6 points
- You can write your answers either in Finnish, Swedish or English.
- Deadline for this assignment is on Thursday, March 8th, 2018 at 16:00.
- Return your report at via MyCourses

Assignment 1.2 – Random number generation

Implement the acceptance/rejection method for generating random variates from the half-normal distribution:

$$f_{|Z|}(x)=\frac{2}{\sqrt{2\pi}}e^{-x^2/2}$$

using, as alternative sampling distribution, the exponential distribution with the density:

$$g(x)=e^{-x.}$$

(The rate/intensity parameter equals 1.) Take the following steps in your procedure:

1. Generate a random variate $X\sim g(x)$ (i.e. X has density g). Use either the built-in generator of your software or, for example, the inverse-transform method.
2. Generate another random variate $U\sim U(0,1)$ independent of X (i.e. U is uniformly distributed between 0 and 1.
3. Take $Y=X$ as the generated random variate if it holds:

$$U\le\frac{f_{|Z|}(X)}{cg(X)},\ \text{where } c=\sup_x\left\{f_{|Z|}(x)/g(x)\right\} \qquad (1.)$$

(sup is essentially the maximum of a function, which you may determine either numerically or analytically.)

Otherwise return to step 1.

Generate a sample of, say, 1000 points with your code and observe the average number of variates X that is needed to produce one accepted random variate Y. Compare this number to the value of c in (1.). What is your observation? What does this imply from the viewpoints of selecting the alternative sampling distribution g and the efficiency of the algorithm.