10th exercises for SIM'2021

Ex. 1
Consider Fisher's z-distribution (Eq. (9.3)) with $\mathrm{f}(x; 2, 10)$ and evaluate $\mathrm{P}(X < 0)$. Use importance sampling for that with Cauchy distribution as the instrumental distribution with $\mathrm{g}(x; 0, 1/2)$.

Ex. 2
Minimize the Rosenbrock function $\mathrm{h}(x, y; a, b) = (a - x)^2 + b\,(y - x^2)^2$ using simulated annealing. Start from $(-1, -1)$ with the choice $a = 1, b = 100$. Try to plot the function together with the chain of the values found by the simulated annealing algorithm.

Ex. 3
Re-do the example with the independent Metropolis-Hastings and Fisher's z-distribution (Eq. (9.3)) in the lecture material, page 9-7. Use Cauchy distribution as the proposal distribution with $\mathrm{g}(x; 0, 1/2)$. Plot the behavior of the estimate for the mean of Fisher's z-distribution against the length of the MCMC chain.