Math 220, Spring 2012, homework 4, due Wednesday February 22

Consider the integral $\int_0^1 \frac{e^{-\sqrt{1-x^2}}dx}{\sqrt{x}}$. Evaluate it by Monte Carlo, (i) as is, i.e., as $E[e^{-\sqrt{1-\xi^2}}/\sqrt{\xi}]$, where ξ is an equidistributed random variable, and (ii) with variance reduction, in which the denominator $\sqrt{x}$ is absorbed into the pdf. In each case, make several runs with different numbers of samples, estimating the variance and the error each time; use these estimates to estimate how many samples you need to get an error of less than 1%. When you are done, compare the two cases. (This is a rephrasing of problem 1, page 44)

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