Lab7

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Exact value of I $I = \int_0^1 e^{\sqrt{x}} dx$ (substituting $\sqrt{x} = t$)

$=2\int_0^1 e^t t dt$

=2

M	confidence intervals(lab 6)	confidence intervals(lab 7)	ratio	Mean(lab 6)	Mean(lab7)
10^2	[1.885,2.084]	[1.994,2.014]	9.732	1.985	2.004
10^3	[1.953,2.008]	[1.996,2.002]	9.246	1.980	1.999
10^4	[1.997,2.014]	[1.998,2.000]	9.219	2.006	1.999
10^5	[1.995,2.000]	[1.999,2.000]	9.493	1.998	1.9999

It is better to use anti-thetic approach as the confidence interval is much smaller

Formulas used to code:

$$\delta_i = y_i - \widehat{\mu}_{i-1}$$
$$\widehat{\mu}_i = \widehat{\mu}_{i-1} + \frac{\delta_i}{i}$$
$$S_i = S_{i-1} + \frac{i-1}{i}\delta_i^2$$

familiar 95% confidence interval $\left(\widehat{\mu}_n - 1.96\frac{s_n}{\sqrt{n}},\ \widehat{\mu}_n + 1.96\frac{s_n}{\sqrt{n}}\right)$.

$$\widehat{\mu}_{\text{anti}} = \frac{1}{m}\sum_{i=1}^{m} Y_i, \qquad s^2_{\text{anti}} = \frac{1}{m-1}\sum_{i=1}^{m}(Y_i - \widehat{\mu}_{\text{anti}})^2.$$

Here
$Y_i = (exp(\sqrt{U_i}) + exp(\sqrt{1-U_i}))/2$