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The last inequality holds because the maximum possible value of $V(X) = P(Y)/(1 - P(Y))$ is $\frac{1}{e}$.

In particular, setting $c = 0.01$, we find that

$$\frac{1}{\sqrt{2\pi}} \int_{-\frac{2\ln c}{\sqrt{n}}}^{\frac{2\ln c}{\sqrt{n}}} e^{-u^2/2} du \geq 0.95$$

so $\frac{2\ln c}{\sqrt{n}} \leq \frac{2\ln 0.01}{\sqrt{n}} \approx -2.29$. This is the minimum sample size required to meet the condition specified in the problem. If $c = 0.001$, then $\frac{2\ln c}{\sqrt{n}}$ must be replaced by $2\ln 0.001 \approx -4.20$, which means that the minimum sample size is $(\frac{4.20}{2})^2 \approx 44$.

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