MITx: 6.041x Introduction to Probability - The Science of Uncertainty

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Exercise: CLT

(2/2 points)

Let X_n be i.i.d. random variables with mean zero and variance σ^2. Let $S_n = X_1 + \cdots + X_n$. Let Φ stand for the standard normal CDF. According to the central limit theorem, and as $n \to \infty$, $\mathbf{P}(S_n \le 2\sigma\sqrt{n})$ converges to $\Phi(a)$, where:

2

$a =$ **Answer:** 2

Furthermore,

1/2

$\mathbf{P}(S_n \le 0)$ converges to: **Answer:** 0.5

(Here, enter the numerical value of the probability.)

Answer:

We have

$$\lim_{n\to\infty}\mathbf{P}(S_n \le 2\sigma\sqrt{n}) = \lim_{n\to\infty}\mathbf{P}\left(\frac{S_n - 0}{\sigma\sqrt{n}} \le 2\right) = \Phi(2).$$

Similarly,

$$\lim_{n\to\infty}\mathbf{P}(S_n \le 0) = \lim_{n\to\infty}\mathbf{P}\left(\frac{S_n - 0}{\sigma\sqrt{n}} \le 0\right) = \Phi(0) = \frac{1}{2}.$$

You have used 1 of 2 submissions