



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



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Bookmark

Problem 1: Convergence in probability

(6/6 points)

For each of the following sequences, determine the value to which it converges in probability.

(a) Let X_1, X_2, \dots be independent continuous random variables, each uniformly distributed between -1 and 1 .

1. Let $U_i = \frac{X_1 + X_2 + \dots + X_i}{i}$, $i = 1, 2, \dots$

What value does the sequence U_i converge to in probability?

2. Let $W_i = \max(X_1, X_2, \dots, X_i)$, $i = 1, 2, \dots$

What value does the sequence W_i converge to in probability?

► Unit 6: Further topics on random variables


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Unit overview


Lec. 18: Inequalities, convergence, and the Weak Law of Large Numbers

Exercises 18 due Apr 27, 2016 at 23:59 UTC 

Lec. 19: The Central Limit Theorem (CLT)

Exercises 19 due Apr 27, 2016 at 23:59 UTC 

Lec. 20: An introduction to classical statistics

Exercises 20 due Apr 27, 2016 at 23:59 UTC 



3. Let $V_i = X_1 \cdot X_2 \cdot \dots \cdot X_i$, $i = 1, 2, \dots$

What value does the sequence V_i converge to in probability?



(b) Let X_1, X_2, \dots be independent identically distributed random variables with $\mathbf{E}[X_i] = 2$ and $\text{var}(X_i) = 9$, and let $Y_i = X_i/2^i$.


1. What value does the sequence Y_i converge to in probability?



2. Let $A_n = \frac{1}{n} \sum_{i=1}^n Y_i$. What value does the sequence A_n converge to in probability?



3.

[Solved problems](#)[Additional theoretical material](#)**Problem Set 8**Problem Set 8 due Apr 27, 2016
at 23:59 UTC [Unit summary](#)

- ▶ [Unit 9: Bernoulli and Poisson processes](#)

Let $Z_i = \frac{1}{3}X_i + \frac{2}{3}X_{i+1}$ for $i = 1, 2, \dots$, and let $M_n = \frac{1}{n} \sum_{i=1}^n Z_i$ for $n = 1, 2, \dots$

What value does the sequence M_n converge to in probability?



You have used 1 of 2 submissions

[Printable problem set available here .](#)

DISCUSSION

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