

MTH 23.5 LECTURE NOTES (Ojakian)

Topic 10: Sampling Distribution and Central Limit Theorem

OUTLINE

References (**Algebra Book**: None; **Statistics Book**: 7.1, 7.2, 7.3)

1. Sampling Distribution
 2. Central Limit Theorem
 3. The new standard deviation for the sampling distribution
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1. Sampling Distributions

- (a) Take ONE ($n = 1$) versus take MANY ($n > 2$)
- (b) Taking ONE: Use symbol like “ x ” (example : $P(x > 3)$)
- (c) Taking MANY: Use symbol like “ \bar{x} ” (example : $P(\bar{x} > 3)$)
- (d) When you take MANY items (say: n) from the same distribution we call this the “sampling distribution” (of size n).

2. Key Facts about Sampling Distribution

- (a) If X is a NORMAL distribution, then its sampling distribution \bar{X} has the same mean, but a new standard deviation = σ/\sqrt{n}
(where X has standard deviation = σ and our sampling distribution is of size n)
- (b) If X is ANY distribution, then **as long as** $n \geq 30$ the following is “approximately true”: its sampling distribution \bar{X} has the same mean, but a new standard deviation = σ/\sqrt{n}
- (c) The last point is called the “Central Limit Theorem”
- (d) For a distribution, the standard deviation of its sampling distribution (with size n) is called the Standard Error (i.e. the Standard Error is σ/\sqrt{n}).
- (e)

PROBLEM 1. *Do some Webwork problems.*

PROBLEM 2. *From 5th Edition, section 7.5 do exercise 16.*