MTH 23.5 LECTURE NOTES (Ojakian)

Topic 20: Central Limit Theorem and Sampling Disribution

OUTLINE

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

1. Sampling Distribution
2. Cental 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 $= \sigma/\sqrt{n}$
(where X has standard deviation $= \sigma$ and our sampling distribution is of size n)

(b) If X is ANY distibution, then **as long as** $n \geq 30$ the following is "appoximately true": its sampling distribution $\bar{X}$ has the same mean, but a new standard deviation $= \sigma/\sqrt{n}$

(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 $\sigma/\sqrt{n}$).

(e)

PROBLEM 1. *Do some Webwork problems.*

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