MATH 10B with Prof. Stankova
Section #209 ; time: 3:30-5pm
GSI: Ninh DO

Quiz 11 Solution

Student:
SID:
Tue 4/16/19

True/False - No explanation needed. (1pt for correct, 0pt - no answer, -1pt - incorrect)

1. The sample std is a biased estimate of the population std. True/False
   False. It is unbiased estimate.

2. If the sample size is very large, the std of the sample mean will approach the population std. True/False
   False. It will approach 0.

Problems - Need justification. No justification means **zero**!

1. (10pts) Anna rolls a fair 4-side dice 100 times. She takes the average.
   (a) Find the 87% CI of the average.
   Hint: use $\bar{\sigma}^2 = \dfrac{\sigma^2}{n-1}$

   $X_1, ..., X_{100} \sim Uniform(1, 4)$ with $\mu = \dfrac{1+4}{2} = 2.5$ and $\sigma^2 = \dfrac{4^2-1}{12} = 1.25$
   $\bar{X} = \dfrac{X_1 + ... + X_{100}}{100}$ with $\bar{\mu} = \mu = 2.5$ and $\bar{\sigma}^2 = \dfrac{\sigma^2}{100-1} = 0.0126 \Rightarrow \bar{\sigma} = 0.112$
   z-score for 87% CI is 1.514 (look at area = 0.435)
   Thus, the 87% CI is: $\bar{\mu} \pm z_{score} * \bar{\sigma} = 2.5 \pm 1.514 * 0.112$

   (b) Find the probability that this average is less than 2.

   $P(\bar{X} < 2) = P(\dfrac{\bar{X} - \bar{\mu}}{\bar{\sigma}} < \dfrac{2 - 2.5}{0.112}) \approx P(Z < -4.4) \approx 0.5 - 0.5 = 0$