Math 321 – Summer 2019

additional practice for chapter 4, central limit theorem

1. If we flip a fair coin many many times, what will the proportion of heads be?

2. Consider that height of a certain demographic category of people has mean 5 foots 9 inches and standard deviation 3 inches. If a group of 30 people of this demographic are randomly selected, what is the probability their mean height is less than 5 foot 8 inches?

3. An internet server has data request that arrive at rate 1000 requests per second. Model the time between requests by an exponential random variable. Scientists would like to study the average energy consumption of the server and need to know the average length of idle time (time between server requests). In order to estimate the probability that energy consumption exceeds a particular threshold they would like to know the probability that the mean wait time between requests exceeds 1.0015 millisecond for a random sample of 1 million requests.

4. Consider a print publisher who has on average 1 error (ink smudge, double printed letter, etc.) every 25 pages. A particular document has 150 pages and 400 copies of it are needed. We are interested in the average number of errors per document.

    (a) Use the Poisson distribution to calculate the probability that the total number of typos in the printed lot (400 copies of the 150 page document) will be greater than 2500. Note that this is identical to there being an average of 6.25 errors or greater per document copy.

    (b) Use the normal approximation given by the central limit theorem to calculate the probability that the mean number of typos per copy will be greater than 6.25.

5. Consider the distribution give by $x = 6, 10$ and $f(x) = 0.2, 0.8$. Find the sampling distribution of $\overline{X}_2$.