Name: _____

MATH 108
Fall 2022
HW 12: Due 11/01

"Facts are stubborn things, but statistics are pliable."

–Mark Twain

Problem 1. (10pt) Suppose that you sample from a distribution with mean 250 and standard deviation 30. Let X denote a random sample from this distribution. Let $\overline{X}$ represent the mean of a simple random sample from this distribution of size 50.

(a) Find $P(X \leq 240)$.

(b) Find $P(X \geq 240)$.

(c) Find $P(\overline{X} \leq 240)$.

(d) Find $P(\overline{X} \geq 240)$.

(e) Could you use your method in (b) and (c) if the sample size were 15? Explain.

Problem 2. (10pt) Suppose that an industrial waste company claims that their operations do not affect the health of local residents. However, the local residents believe otherwise. Suppose that the percentage of the US population with a certain type of cancer has a distribution with average 5% and standard deviation 1%. What is the probability that if the residents took a simple random sample of size 10 from their community that the percentage of them having that type of cancer was more than 6.5%? If the sample suggested that 9% of the community was affected by that type of cancer, does the company's claim seem likely?

Problem 3. (10pt) Suppose that you are an engineer at a company that produces laptops and other electronic devices. You are trying to give data to the marketing team so that they know how to advertise the company's new laptop. The team would like to know the average battery life for this laptop. You take a simple random sample of 40 laptops and find an average battery life of 12.5 hours. Based on the construction of the laptop, the battery life for this type of computer is known to have a standard deviation of 1.3 hours. Construct and interpret in the context of the problem a 95% confidence interval for the average battery life of this new laptop.