

Homework 09

Calculus II

College of the Atlantic. March 6, 2025

There is also a WeBWorK assignment. It is only one problem.

It is well known that the average mass of wild unicorns is 100 kg with a standard deviation of 12.

1. In your cosmic ray unicorn-creation experiments you have created 55 unicorns. You measure the masses of these 55 unicorns and determine that their average mass is 96. Hmmm... Is the mass of this group of unicorns unusually low compared to wild unicorns?
 - (a) If you sampled 55 wild unicorns, how would that mean be distributed?
 - (b) How likely is it that if you sampled 55 wild unicorns you would get a mean of 96 or smaller. Write the answer as an integral, and then use a computer to evaluate the integral. (You just calculated a one-tailed p-value. Congratulations.)
 - (c) How likely is it that if you sampled 55 wild unicorns you would get a mean that was smaller than 96 or larger than 104. Write the answer as an integral, and then determine a numerical value for the integral. (You just calculated a two-tailed p-value. Congratulations, again.)
2. Repeat the above question for an experimental run in which you generated 55 unicorns and their average mass is 99 kg.
3. Repeat the above question for an experimental run in which you generated 900 unicorns and their average mass is 99 kg.



Figure 1: An illustration from the book *The history of four-footed beasts and serpents* by Edward Topsell. Special Collections, University of Huston Libraries. Creative Commons CC0 1.0 Universal Public Domain Dedication. <https://commons.wikimedia.org/wiki/File:Oftheunicorn.jpg>.