

Rensselaer Polytechnic Institute
Department of Electrical, Computer, and Systems Engineering
ECSE 2500: Engineering Probability, Spring 2023

Homework #5: due Wednesday, March 22th, at 11:59PM.

Show all work for full credit!

Submit your work as a single PDF on Gradescope, labeling each problem number with a page.

1. (30 points.) Let X be the time it takes for a university president to be inaugurated. We model X as a Gaussian random variable with mean 1.5 hours and standard deviation 0.25 hours. Use the numerical Q table from the book (p. 169) or another source to estimate the following probabilities to 4 decimal places. You can also use an online Q function calculator, but keep in mind you will only have access to the printed Q table on the exams.
 - (a) (10 points) $P(X > 2)$
 - (b) (10 points) $P(|X - 1.5| > 0.1)$
 - (c) (10 points) $P(X \in [1.2, 1.75])$

2. (20 points.) Now let Y be the time it takes for a university president to eat a hot dog, modeled as a Gaussian random variable with mean 50 sec and standard deviation 6 sec. Use the Q table (or an online inverse Q function calculator) to estimate the following values.
 - (a) (10 points.) The value a such that $P(Y > a) = 0.2$
 - (b) (10 points.) The value b such that $P(|X - 50| < b) = 0.4$

3. (50 points.) Vi and Jinx attempt to destroy the Nexuses in each others' bases. Let V represent the damage Vi can do in one attempt, and J represent the the damage Jinx can do in one attempt. We model V as a Gaussian with mean 404 and variance 9, and J as a Gaussian with mean 400 and variance 25. (Note these are variances, not standard deviations.)
 - (a) (10 points) Who is more likely to do at least 407 damage?
 - (b) (10 points) Who is more likely to do at least 416 damage?
 - (c) (15 points) Compute the value D for which $P(V < D) = P(J < D)$. That is, if d is below D , Vi is more likely than Jinx to do more than d damage (since Jinx has a lower mean). If d is above D , Jinx is more likely than Vi to do more than d damage (since Vi has a lower variance).
 - (d) (15 points) Compute the probability that Jinx did more than 412 damage, given that she has done at least 406 damage.