Exam 2
STAT 346, Fall 2019

Instructions: This is an open book and open notes exam; you can use any written or printed materials that you have brought with you, but you are not allowed to share any materials during the exam period. You are not allowed to communicate with anyone (verbally, in writing, or electronically), except for me, during the exam period (and at most I will clarify the statement of a problem; I won't give you any hints about how to solve a problem). You can use a calculator and/or a computer if you wish to. Cell phones should be kept out of your hands during the exam period.

The 9 parts of the 5 problems are weighted equally, and I'll count your best 8 (of 9) scores from these parts.

Unless stated otherwise, for all parts of the exam you are to justify your answers, using notation and terminology properly, and clearly defining any events and random variables that you use (that aren't defined in the statement of the problem).

Express probabilities, expected values, variances, etc. as exact values (as fractions, integers, or in decimal form), or else round them to the nearest thousandth. Express them numerically — do not express final answers as expressions that need to be evaluated. (E.g., the standard normal cdf or the gamma function should not appear in any of your final answers.)

Put all of your work on these sheets. If you need more room, direct me to look for additional work on the back of a page. **Draw boxes around your final answers!**

1) What is the value of $P(X \geq 3)$ if X is a $\mathrm{N}(4, 9)$ random variable?

2) Suppose that a card player will be dealt a random subset of 5 cards twenty different times, each time starting with a randomly-ordered standard deck of 52 playing cards. What is the expected number of times he'll get at least two aces among his five cards?

3) Let X be a random variable having cdf

$$F(x) = \begin{cases} 1, & x \geq 1, \\ 7/8, & 0 \leq x < 1, \\ 1/8, & -1 \leq x < 0, \\ 0, & x < -1. \end{cases}$$

Give the value of $Var\,(2 - 2X)$.

4) Consider a Poisson process having a rate of 4 events per hour, let T be the waiting time (in hours) until the 2nd event occurs. Give the value of $P(T \leq 2)$.

5) Let X be a random variable having pdf

$$f(x) = \frac{3}{x^4} I_{(1,\infty)}(x).$$

(a) Give the cdf of X.

(b) Give the value of $P(X > 3)$.

(c) Letting U be a uniform $(0, 1)$ random variable, give a function of U that has the same distribution as X.

(d) Give the pdf of $Y = 1/X$.

(e) Give the value of $E(1/X)$.