STAT/MA 41600
Midterm Exam #2: November 16, 2016

Name _____

Purdue student ID (10 digits) _____

1. The testing booklet contains 5 questions, but students only need to answer 4 of the questions. The 4 questions chosen by the student will all be weighted evenly (i.e., each question is worth 1/4 of the midterm exam grade). The bonus question is *purely optional*.

2. Permitted Texas Instruments calculators:
   BA-35
   BA II Plus*
   BA II Plus Professional Edition*
   TI-30XS MultiView*
   TI-30Xa
   TI-30XIIS*
   TI-30XIIB*
   TI-30XB MultiView*
   *The memory of the calculator should be cleared at the start of the exam.

3. **Circle your final answer in your booklet**; otherwise, no credit may be given.

4. There is no penalty for guessing or partial work.

5. Show all your work in the exam booklet. If the majority of questions are answered correctly, but insufficient work is given, the exam could be considered for academic misconduct.

6. Extra sheets of paper are available from the proctor.

1. On Thanksgiving Day, let X denote the remaining time (in hours) until the turkey finishes cooking, and let Y denote the time (in hours) until mother arrives. Suppose X and Y are independent random variables with joint probability density function

$$f_{X,Y}(x,y) = 21e^{-3x-7y}$$

for $x > 0$ and $y > 0$; and $f_{X,Y}(x,y) = 0$ otherwise. Compute $P(Y \leq 3X)$.

Grade this question? Yes No

2. The Jelly Belly factory has determined that, in a certain region of the country, the number of jelly beans consumed on a holiday has a Poisson distribution with mean 1,000,000. Therefore it is reasonable to assume that the number of beans consumed in one hour is a Poisson random variable with mean 41666.67.

Estimate the probability that the number of jelly beans produced during such a one hour period is between 41600 and 41700 (inclusive).

Grade this question? Yes No

3. A class has a big exam before Thanksgiving, and all of the 400 students are invited to attend the help session. From past experience, the instructor finds that each student is 60% likely to attend the help session. If the students behave independently, estimate the probability that between 230 and 250 (inclusive) students attend the help session.

Grade this question? Yes No

4. Appetizers are served sometime during the next 10 minutes. Let this time X be uniformly distributed on $[0, 10]$. The time until the turkey is ready is an Exponential random variable Y with $\mathbb{E}(Y) = 5$. It is safe to assume that X and Y are independent. Find $P(X < Y)$.

Grade this question? Yes No

5. Let X and Y denote the (respective) times until an aunt and grandfather arrive to a meal. The aunt always arrives first. Suppose X and Y have joint probability density function

$$f_{X,Y}(x,y) = 10e^{-3x-2y}$$

for $0 < x < y$; and $f_{X,Y}(x,y) = 0$ otherwise. (Note that X and Y are not independent, since we are insisting that $X < Y$ in this setup!)

Find the conditional probability that $Y > 3$, given $X = 2$, i.e., find $P(Y > 3 \mid X = 2)$.

Grade this question? Yes No

BONUS (OPTIONAL). Let X, Y, and Z be independent uniform $(0, 1)$ variables. Find the probability that the largest exceeds the sum of the other two.