Midterm Exam I

Math 361 **Name:** _____
9/27/10

Read all of the following information before starting the exam:

- READ EACH OF THE PROBLEMS OF THE EXAM CAREFULLY!
- Show all work, clearly and in order, if you want to get full credit. I reserve the right to take off points if I cannot see how you arrived at your answer (even if your final answer is correct).
- A single 8 1/2 × 11 sheet of notes (double sided) is allowed. Calculators are permitted.
- Circle or otherwise indicate your final answers.
- Please keep your written answers clear, concise and to the point.
- This test has . problems and is worth 100 points. It is your responsibility to make sure that you have all of the pages!
- Turn off cellphones, etc.
- READ EACH OF THE PROBLEMS OF THE EXAM CAREFULLY!
- Good luck!

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1. (*20 points*) There are two urns. The first has 3 red balls and 5 blue balls, the second has 6 red balls and 100 blue balls. A coin is flipped. If heads comes up a uniform random ball is picked from the first urn, if tails comes up a uniform random ball is picked from the second. Given that the picked ball is blue, what is the conditional probability that the coin was a heads.

2. (*20 points*) A hand of 4 cards is picked from a standard deck. Compute

a. (*7 pts*) the probability that every card in the hand is of the same suit.

b. (*7 pts*) The hand contains exactly one pair.

c. (*6 pts*) Every card in the hand is a different suit and a different rank.

3. (*20 points*) X is a continuous random variable with pdf $f(x) = 2e^{-2x}$ if $x \geq 0$, and $f(x) = 0$ otherwise. Compute

a. (*7 pts*) $\mathbb{P}(\mathrm{X} \in \mathrm{C}_1)$ where $C_1 = \mathbb{N} = \{1, 2, 3, 4, \ldots\}$.

b. (*7 pts*) $\mathbb{P}(\mathrm{X} \geq 3)$

c. (*6 pts*) $\mathbb{P}(\mathrm{X} \geq 3 | \mathrm{X} \geq 2)$.

4. (*20 points*) Two fair dice are rolled.

a. (*10 pts*) Let X denote the absolute value of the difference between the rolls. Compute the pmf $p(x)$ of X.

b. (*10 pts*) Determine the probability that the product of the two rolls is greater than the sum of the two rolls.

5. (*20 points*) **a.** (*10 pts*) Could $F(x) = \frac{1}{2}^x$ for $x = 0, 1, 2, 3 \ldots$ denote the cdf of a random variable X. Why or why not?

b. (*10 pts*) A continuous random variable X has pdf $f(x) = \frac{1}{x^2}$ for $x \geq 1$, 0 otherwise. Compute the cdf and pdf of $Y = X^2$.

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