Midterm Exam I
Math 361
9/27/10
Name: ____________________________

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) $P(X \in C_1)$ where $C_1 = \mathbb{N} = \{1, 2, 3, 4, \ldots \}$.
   
   b. (7 pts) $P(X \geq 3)$
   
   c. (6 pts) $P(X \geq 3 | X \geq 2)$. 
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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