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 $\times$ 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*) A coin is flipped until there are two heads in a row, or three tails. Find the probability that the three tails comes first.

2. (*20 points*) Three integers are chosen with replacement from the first twenty integers. Find the probability that **a.** (*10 pts*) Their sum is even

b. (*10 pts*) Their product is even.

3. (*20 points*) X is a continuous random variable with cdf $F_X(x) = 1 - (1-x)^2$ for $0 \le x \le 1$, with $F_X(x) = 0$ for $x \le 0$, and $F_X(x) = 1$ for $x \ge 1$. **a.** (*10 pts*) Find the pdf of X.

b. (*10 pts*) Let $Y = 2(X+1)^2$. Find the cdf of Y.

4. (*20 points*) A random integer N from 1 to 10 is chosen uniformly at random.

a. (*10 pts*) The random variable X denotes the number of distinct prime factors of N. (So if $N = 8 = 2^3$, $X = 1$). Find the pmf of X.

b. (*10 pts*) Another random integer N' from 1 to 10 is also chosen uniformly at random. Find the probability that $N > 2N'$.

5. (*20 points*) Is it possible for two events A and B with $\mathbb{P}(\mathrm{A}), \mathbb{P}(\mathrm{B}) > 0$ to be both mutually exclusive and independent. Why or why not?

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