CS 2800 - Homework 8 - Due Wednesday April 14 at the beginning of lecture

INCLUDE THIS COVER PAGE WITH YOUR HOMEWORK

NETID:

NAME:

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problem	grade	memo
1		
2		
3		
4		
5		
total		

You should justify/prove all your answers.

Problem 1

Suppose we pick n points in a square of side length 3. How big does n have to be so that we are guaranteed to have two points within distance at most $\sqrt{2}$ of each other.

Make sure you justify your answer.

Problem 2

In poker we have 52 cards, where each card has a suite and a value. There are 4 possible suites and 13 possible values, and each combination is a different card.

A three-of-a-kind is a set of five cards such that three of them have the same value v, and the other two have values w_1 and w_2, where these are all distinct (i.e. a triple and a pair together do not form a three-of-a-kind).

How many three-of-a-kinds are there?

Problem 3

Recall that two events A and B are independent if $P(A \cap B) = P(A)P(B)$. We say that three events A, B and C are mutually independent if $P(A \cap B \cap B) = P(A)P(B)P(C)$.

Give an example of 3 events such that each pair is independent but they are not all mutually independent.

For this problem you need to define a probability space and the events.

Problem 4

Suppose n people are seated at a restaurant, and each order a different dish. An incompetent waiter puts each dish in front of each person with equal probability. What is the probability that person i gets what they order? What is the expected number of people who get what they order?

Hint: use linearity of expectation.

Problem 5

Show that a graph is bipartite if and only if it has no odd-length cycles.