CS109 Midterm Examination

This is a closed calculator/computer exam. You are, however, allowed to use notes in the exam. The last page of the exam is a Standard Normal Table, in case you need it.

You have 2 hours (120 minutes) to take the exam. The exam is 120 points, meant to roughly correspond to one point per minute of the exam. You may want to use the point allocation for each problem as an indicator for pacing yourself on the exam.

In the event of an incorrect answer, any explanation you provide of how you obtained your answer can potentially allow us to give you partial credit for a problem. For example, describe the distributions and parameter values you used, where appropriate. It is fine for your answers to include summations, products, factorials, exponentials, and combinations, unless the question specifically asks for a numeric quantity or closed form. Where numeric answers are required, the use of fractions is fine.

Problem	Score
1 (17 pts)	
2 (16 pts)	
3 (26 pts)	
4 (20 pts)	
5 (16 pts)	
6 (25 pts)	
Total (120 pts)	

THE STANFORD UNIVERSITY HONOR CODE

A. The Honor Code is an undertaking of the students, individually and collectively:

(1) that they will not give or receive aid in examinations; that they will not give or receive unpermitted aid in class work, in the preparation of reports, or in any other work that is to be used by the instructor as the basis of grading;

(2) that they will do their share and take an active part in seeing to it that others as well as themselves uphold the spirit and letter of the Honor Code.

B. The faculty on its part manifests its confidence in the honor of its students by refraining from proctoring examinations and from taking unusual and unreasonable precautions to prevent the forms of dishonesty mentioned above. The faculty will also avoid as far as practicable, academic procedures that create temptations to violate the Honor Code.

C. While the faculty alone has the right and obligation to set academic requirements, the students and faculty will work together to create optimal conditions for honorable academic work.

I acknowledge and accept the letter and spirit of the honor code:

Signature: _____

Name (print): _____

1. **Spotify** (17 points)

You ask Spotify (a music streaming service) to shuffle songs from a playlist with 10 songs by 5 different artists (A, B, C, D and E). There are 2 songs by each artist.

    a. (4 points) What is the total number of orderings of the 10 songs (each song is distinct)?

    b. (4 points) Spotify realizes that if it plays two songs from the same artist in a row, users don't trust that the shuffle was truly random. What is the probability that a random ordering of the songs has two songs from artist A in a row?