ICS 141: Discrete Mathematics for Computer Scie	ence I
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Spring 2025

Problem Set 8

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Due: Tuesday, May 6, 2025 at 1:30pm

1 Applying Bayes' Theorem (30 pts)

Suppose that one person in 4,000 people has a genetic disease. There is a diagnostic test for the disease; 98.5% of people with the disease test positive and only 0.01% of people who do not have the disease test positive.

- (a) **(15 pts)** What is the probability that someone who tests positive has the genetic disease? Show your work.
- (b) **(15 pts)** What is the probability that someone who tests negative does not have the disease? Show your work.

2 Expected Value of a Transformed Random Variable (30 pts)

Let X be an indicator random variable such that E[X] = 2/3. Let $Y = (2 - 3X)^2$ be another (regular) random variable. What is the expected value of Y? Show your work.

3 Birthday Problem Redux (40 pts)

A group of n people are in a room. Each person is equally likely to be born on any of the 365 days of the year and birthdays are assigned independently. What is expected number of distinct pairs of people who share the same birthday? Show your work.