

## Introduction to Probability and Statistics - 18.05

Test 1

Wednesday March 12, 2008

**Guidelines:** You have 55 minutes to complete the test. You are allowed to use calculators but no written material is allowed. Your answers must include **clear and short** explanations. Correct answers with poor explanations will not receive full credit. The credit points are divided evenly between the 4 questions. Don't forget to write your full name at the top of the answers sheet. Good luck!

- Define the variance of a random variable.
  - True or false: If  $X$  is a discrete r.v. and there are at least two values  $x$  and  $y$  such that  $x \neq y$  and  $\Pr[X = x] > 0$  as well as  $\Pr[X = y] > 0$ , then  $\text{Var}(X) > 0$ .
- $X$  has a normal distribution with  $\mu = 3$  and  $\sigma^2 = 4$ . What is the probability that  $X > 4$ ?
- A skier has a probability 0.7 of passing each turn without falling (this probability is independent of whether he fell or not in other turns). Let  $X$  be the number of turns he passes without falling in a trail that has 10 turns.
  - What is the expected value of  $X$ ?
  - What is the variance of  $X$ ?
  - What is the probability that  $X = 2$ ?
- Three buses leave a school going on a field trip. On the first bus there are 20 girls and 18 boys, on the second there are 21 girls and 21 boys, and on the third there are 15 girls and 22 boys. When the buses arrive at their destination we pick one of the kids at random. Given that she is a girl, what is the probability that she was on the first bus?