

### Quiz #3

1. A standard deck of 52 cards is shuffled and the top two cards are put on a table, face down. You win \$10 if the second card is the queen of hearts.

- (a) What is your chance of winning \$10?

The probability that the second card is the queen of hearts is

$$P = \frac{1}{52}.$$

- (b) You turn over the first card. It is the seven of clubs. Now what is your chance of winning?

The probability that the second card is the queen of hearts is

$$P = \frac{1}{51}.$$

2. Suppose  $X$  is a continuous random variable.

- (a) What is  $P(a \leq X \leq a)$ ?

$$P(a \leq X \leq a) = 0.$$

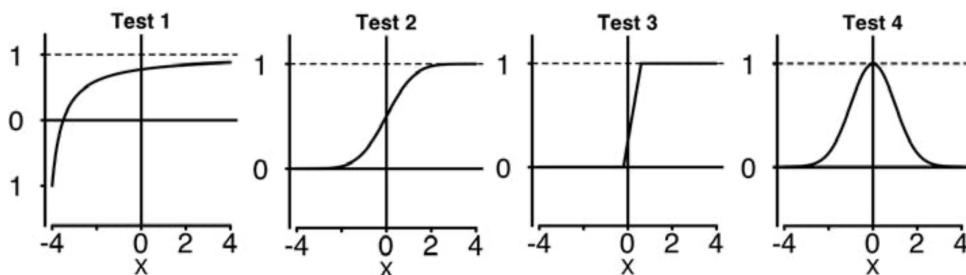
- (b) What is  $P(X = 0)$ ?

$$P(X = 0) = 0.$$

- (c) Does  $P(X = 2) = 0$  mean that  $X$  never equals 2?

No. For a continuous random variable, the probability of any single exact value is zero. Only an interval (range) of values can have nonzero probability.

3. Which of the following are valid cumulative distribution functions? Why are the others not valid?



Test 2 and Test 3. Test 1 is not a cdf: it takes negative values, but probabilities are positive. Test 2 is a cdf: it increases from 0 to 1. Test 3 is a cdf: it increases from 0 to 1. Test 4 is not a cdf: it decreases. A cdf must be non-decreasing since it represents accumulated probability.