Stat 11 Spring 2001 Quiz 1 Solutions

Instructions: There are 10 questions worth 20 pts total. This quiz is worth the same as a homework.

1. (2 points) Consider 4 Bernoulli trials, each with the success probability of 1/2. The probability that three trials result in success is
   a) 1
   b) 1/2
   c) 1/4
   d) 1/16

2. (2 points) Suppose we have 5 red balls and 5 black balls in a box. Suppose we make three successive draws of balls from the box and note their colour. Define the draw of a black ball to be success. After each draw, the balls are not returned to the box. This is an example of sampling without replacement and the successive trials are not independent. Therefore the trials are not Bernoulli trials.

3. (2 points) Let $X \sim Bin(n, p)$ be a random variable. Then $X$ has mean $np$ and variance $npq$.

4. (2 points) Suppose you throw a dart at a board 10 times. Suppose that the probability that you hit the bulls-eye each time is the same, and that this probability is 1/3. Furthermore, assume that the probability that you hit the bulls-eye on one throw is independent of hitting the bulls-eye on another throw. Let $X$ be the number of times you miss the bulls-eye. Then $X$ has distribution
   a) Bin(10, 1/3)
   b) Bin(10, 2/3)
   c) Bin(1/3, 10)
   d) $N(10/3, \sqrt{20/9})$
   e) $P(X = 10)$

5. (2 points) The total area under the probability density curve is 1. The probability density curve $f(x)$ satisfies the property that $f(x) \geq 0$ for all x.

6. (2 points) If $X$ is a continuous random variable, then the first quartile is the 25th percentile and corresponds to the number $q$ such that $P(q \leq X) = 0.75$.

7. (2 points) The particular normal distribution that has mean 0 and standard deviation of 1 is called the standard normal distribution.

8. (2 points) Let $Z \sim N(0, 1)$. Let $a > 0$. Suppose that $P(a \leq Z) = 0.15$. Then $P(-a \leq Z \leq a)$ is equal to which of the following alternatives? (Suggestion: Draw a picture.)
9. (2 points) If $X$ is normally distributed with mean 10 and variance 4, then $P(X \leq 22)$ is equal to (where $Z$ represents the standard normal)
   a) $P(Z \leq -6)$
   b) $P(Z \leq -3)$
   c) $P(Z \leq 3)$
   d) $P(Z \leq 6)$
   e) $P(Z \leq 8)$
   f) $P(Z \leq 12)$
   g) $P(Z \leq 24)$

10. (2 points) Let $B \sim Bin(20, 0.4)$. Then $P(B < 10)$ may be approximated by (using the continuity correction) $P(X < 9.5)$ where $X$ is a normal distribution with mean 8.