Exam 2

Name: _____

1: Consider a random variable X with probability distribution function

$$f(x) = \begin{cases} 1/2 & \text{for } 0 < x < 1 \\ 1/2 & \text{for } 2 < x < 3 \\ 0 & \text{elsewhere} \end{cases}$$

(A) Sketch f(x).

(B) Find the cumulative distribution function, $F(x)$, and sketch it.

(C) Find EX.

(D) Find var(X).

2: (A) State Chebyshev's inequality.

(B) Let X be a binomial random variable with 18 trials and probability 1/3 of success. What lower bound on $\Pr(3 < X < 9)$ does Chebyshev's inequality imply?

3: Suppose you have an urn with 1 red ball, 2 green balls, and 3 blue balls and you draw 3 balls out (without replacement.) Let X denote the number of red balls you drew and Y denote the number of green balls you drew.

(A) Find the joint distribution for X and Y.

(A) Find the conditional distribution for X given Y.

(C) Find the correlation between X and Y.

4: Let X and Y be independent standard normal random variables. Let

$$R = \sqrt{X^2 + Y^2} \qquad \text{and} \qquad \Theta = \arctan(Y/X)$$

Find the joint distribution function for R and Θ.

5: Given 10 independent, identically distribution, uniform distributions on $[0, 1]$, what is the joint distribution function for the third, sixth, and tenth order statistics?