Review Problems for Exam 0

Problem 1. Suppose Y is a random variable with cdf

$$F_Y(a) = \begin{cases} 0 & \text{if } a < 1, \\ 0.2 & \text{if } 1 \le a < 3, \\ 0.5 & \text{if } 3 \le a < 5, \\ 0.6 & \text{if } 5 \le a < 7, \\ 0.9 & \text{if } 7 \le a < 9, \\ 1 & \text{if } a \ge 9 \end{cases}$$

a. Is Y discrete or continuous? Briefly explain why.
b. What is the pmf/pdf of Y?
c. What is the expected value of Y?
d. What is the variance of Y?
e. What is the maximum possible value of Y? Briefly explain why.

Problem 2. Suppose X is a continuous random variable with pdf

$$f_X(a) = \begin{cases} 0 & \text{if } a < 0, \\ a & \text{if } 0 \le a \le 1, \\ 2 - a & \text{if } 1 < a \le 2, \\ 0 & \text{if } a > 2 \end{cases}$$

a. What is the cdf of X?
b. What is the expected value of X?
c. What is the variance of X?
d. What is the probability that X is in the interval $[1/2, 3/4]$?
e. What is the maximum possible value of X? Briefly explain why.

Problem 3. Patients arrive at the Simplexville Hospital Emergency Room in one of three ways. Last year, 43% arrived as walk-ins, 53% arrived by ambulance (either air or ground), and 4% arrived by a public service vehicle (e.g. police car, social service vehicle). 73% of the patients who arrived by ambulance were given an MRI, compared with 63% of walk-ins and 59% of those who arrived by a public service vehicle. 11% of the patients who arrived by ambulance were admitted to the intensive care unit (ICU), compared with 0.2% of walk-ins and 6% of those who arrived by a public service vehicle. Select one of last year's patients at random.

a. What is the probability that this patient arrived as a walk-in and was given an MRI?
b. What is the probability that this patient was admitted to the ICU?
c. What is the probability that this patient arrived by ambulance, given that they were admitted to the ICU?