

Question: Discrete Random Variables (worth 8 points)

Consider a discrete random variable that takes on just two possible values (known as a Bernoulli random variable). Let its probability density function be given by $X = x_1 = -a$ with probability b and $X = x_2 = a$ with probability $(1 - b)$.

a) Write down an expression for the mean (expected value) of this Bernoulli random variable. (3 points)

b) If $b = 1/3$, what is the mean of this random variable? (2 points)

c) If $b = 1/3$, what is the variance of this random variable, $SD(X)$? [Recall: the standard deviation is the square root of the variance.] (3 points)

Question: Continuous Random Variables (worth 8 points)

We write the probability density function of a continuous random variable X as $f(x)$, for $a < x < b$.

a) What must be true of this probability density function in the case of a continuous random variable? [Hint: integral.] (2 points)

For the remainder of this question, consider the specific case of a uniformly distributed random variable, $X \sim U(-2, 2)$, where $-2 \leq x \leq 2$. [Hint: recall that the pdf of such a variable has a rectangular shape.]

b) What is the value of $f(x)$, for $-2 \leq x \leq 2$? (3 points)

c) What is the probability that the random variable is less than some arbitrary number c , written $P(X < c)$, where $c \in [-2, 2]$? (3 points)

Question: Continuous Random Variables – the Normal Distribution (worth 4 points)

Consider a random error term X that follows a normal distribution, with mean μ and variance σ^2 .

a) What is the precise expression for the probability density function (in this case, $f(x)$) of this normal random variable? (4 points)