

Homework 7

Due March 5, 2020 at 11:59 PM

1. Let X be the total medical expenses incurred by a particular individual during a given year. Although X is a discrete random variable, suppose its distribution is quite well approximated by a continuous distribution with pdf $f(x) = k(1 + x/2.5)^{-7}$ for $x \geq 0$.
 - (a) What is the value of k ? (2 points)
 - (b) Graph the pdf of X . (2 points)
 - (c) What are the expected value and standard deviation of total medical expenses? (4 points)
 - (d) This individual is covered by an insurance plan that entails a \$500 deductible provision (so the first \$500 worth of expenses are paid by the individual). Then the plan will pay 80% of any additional expenses exceeding \$500, and the maximum payment by the individual (including the deductible amount) is \$2500. Let Y denote the amount of this individual's medical expenses paid by the insurance company. What is the expected value of Y ? [Hint: First figure out what value of X corresponds to the maximum out-of-pocket expenses of \$2500. Then write an expression for Y as a function of X (which involves several different pieces) and calculate the expected value of this function.] (4 points)
2. In a system with a large number of particles, the magnitude of velocity X of these particles can be described by the Maxwell distribution, the pdf is given by

$$f(x) = \begin{cases} Ax^2 e^{-x^2/b} & , x > 0 \\ 0 & , \text{otherwise} \end{cases} ,$$

where $b = m/(2kT)$. k is the Boltzmann's constant, T is the thermodynamic temperature, and m is the particle mass. Suppose b is known, express the constant A in terms of b . (4 points)

3. P. 263: 2 (2×9 points)
4. P. 263: 3 (2×8 points)