

Homework 8

Math 262

due 5:00pm on Monday, March 21

Write your solutions to the following problems clearly and neatly. Make sure to explain your reasoning and provide mathematical details that support your answers. For a few tips on writing solutions, see [this helpful guide for mathematical writing](#).

You may write or type your solutions electronically, or write them on paper and scan or photograph them. Upload a single file containing your solutions to the [Homework 8](#) assignment on Moodle.

Book Problems

- Section 2.6 #102, 105 (pages 122–123)
- Section 2.7 #107, 109, 113, 114, 117, 120 (pages 158–160)

Additional Problems

1. For a certain section of forest, the number X of diseased trees per acre has a Poisson distribution with mean $\mu = 10$. To treat the trees, spraying equipment is rented for \$150. The diseased trees are sprayed with insecticide at a cost of \$5 per tree. Let C be total cost of spraying a randomly selected acre of forest.
 - (a) Find the moment generating function of C .
 - (b) Find the expected value and standard deviation for C .
 - (c) Use Chebyshev's inequality to find an interval that contains C with probability of at least 0.8.
 - (d) Using your knowledge about the Poisson distribution, find a smaller interval than what you found in part (c) that still contains C with a probability of at least 0.8. (Note that X has a Poisson distribution, but C does not.)
2. Find the distributions of the random variables that have each of the following moment-generating functions. (*Hint*: refer to Section 2.7.3 in the textbook.) Be sure to state the values of any parameters necessary to specify each distribution.
 - (a) $M_X(t) = \left[\frac{1}{3}e^t + \frac{2}{3}\right]^5$
 - (b) $M_Y(t) = \frac{2e^t}{3-e^t}$
 - (c) $M_Z(t) = e^{3(e^t-1)}$