

# Homework 8

Math 262

due 5:00pm on Wednesday, September 30

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)  $M_Z(t) = e^{3(e^t-1)}$