Instructions: This homework is due at the beginning of class Thursday, Sept. 11. Also, the problems are to be placed in order in your hw. A subset of the following questions will be graded. If you have any questions about this hw, please contact me.

0: Be sure to read chapter 1 and chapter 4, sections 4.1-4.6.

1: Consider the distillation column example in section 1-2.
   i. Give one of the weaknesses (problems) of investigating the column using a retrospective study.
   ii. Give one of the weaknesses of investigating the column using an observational study.

2 Some questions about studies and experiments:
   i. What is the main difference between an observational study and a designed experiment?
   ii. Why do engineers need to do experiments as opposed to solving the problem directly by using scientific/engineering theory?

3: problem 4.7, page 111

4: For problem 4.13, page 113, do the following:
   i Do parts a and d.
   ii Determine the density function, \( f_X \), of \( X \).

5: Determine the CDF of \( X \) given that the density of \( X \) is
   \[
   f_X(x) = \begin{cases} 
   2x, & 0 \leq x \leq 1 \\
   0, & \text{elsewhere}
   \end{cases}
   \]

6: problem 4.28, page 115

7: problem 4.39, page 117

8: problem 4.49, parts a, c, and e, page 125

9: problem 4.51, parts a, c, and e, page 125

10: problem 4.59, parts a, c, e, page 125

11: problem 4.58, page 125

12: problem 4.68, page 126