CE 225 CIVIL ENGINEERING STATISTICS HOMEWORK 2

1. The storm run-off X (in cubic meters per second, cms) from a subdivision can be modeled by a random variable with the following probability density function:

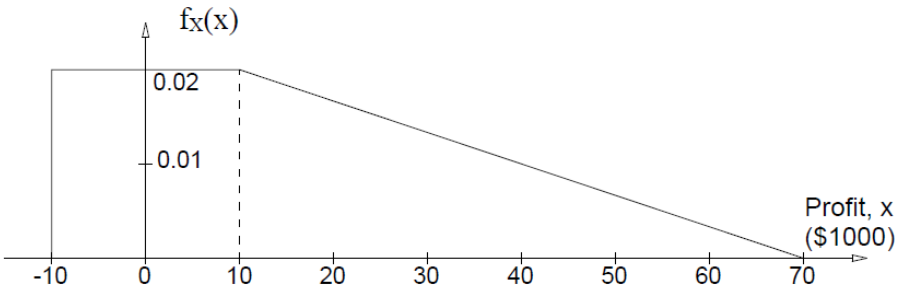
$$f_X(x) = \begin{cases} c\left(x - \frac{x^2}{6}\right); & \text{for } 0 \le x \le 6 \\ 0 \quad ; & \text{otherwise} \end{cases}$$

(a) Determine the constant c and sketch the density function. (ans. 1/6)

(b) The run-off is carried by a pipe with a capacity of 4 cms. Overflow occurs when the run-off exceeds the pipe capacity. If overflow occurs after a storm, what is the probability that the run-off in this storm is less than 5 cms? (ans. 0.714)

(c) An engineer considers replacing the current pipe by a larger pipe having a capacity of 5 cms. Suppose there is a probability of 60% that the replacement would be completed by the next storm. What is the probability of overflow in the next storm? (ans. 0.148)

2. The profit (in thousand dollars) of a construction job is described by the following probability density function:



(a) What is the probability that the contractor will lose money on this job? (ans. 0.2)

(b) Suppose the contractor declares that he has made money on this job; what is the probability that his profit was more than 40 thousand dollars? (ans. 0.1875)

Use the following description to answer the next 4 questions.

A plant uses two different assembly lines: A and A'. Line A is older and suspected of needing repair, whereas Line A' is very new. Suppose on a given day, line A has assembled 9 components, of which 3 have been identified as defective (B) and 6 as non-defective (B'), whereas A' has produced 1 defective and 11 non-defective components. The quality assurance engineer randomly selects 1 of the 21 total components for analysis.

	Condition	
	B	B'
Line A	3	6
Line A'	1	11

3. (2pts) What is the probability that the randomly selected component is from line A?

4. (2pts) If the chosen component is defective, what is the probability that the component is from line A?

5. (2pts) If the chosen component is from line A', what is the probability that the component is not defective?

6. (2pts) Are the events A and B independent? Why?