

13. Example 4.5 introduced the concept of time headway in traffic flow and proposed a particular distribution for X = the headway between two randomly selected consecutive cars (sec). Suppose that in a different traffic environment, the distribution of time headway has the form

$$f(x) = \begin{cases} \frac{k}{x^4} & x > 1 \\ 0 & x \leq 1 \end{cases}$$

- a. Determine the value of k for which $f(x)$ is a legitimate pdf.
 - b. Obtain the cumulative distribution function
 - c. Use the cdf from (b) to determine the probability that headway exceeds 2 sec and also the probability that headway is between 2 and 3 sec.
 - d. Obtain the mean value of headway and the standard deviation of headway
 - e. What is the probability that headway is within 1 standard deviation of the mean value?
35. In a road paving process, asphalt mix is delivered to the hopper of the paver by trucks that haul the material from the batching plant. The article **“Modeling of Simultaneously Continuous and Stochastic Construction Activities for Simulation” (J. of Construction Engr. and Mgmt., 2013: 1037-1045)** proposed a normal distribution with mean value 8.46 min and standard deviation .913 min for the X = truck haul time.
- a. What is the probability that haul time will be at least 10 min? Will exceed 10 min?
 - b. What is the probability that haul time will exceed 15 min?
 - c. What is the probability that haul time will be between 8 and 10 min?
 - d. What value c is such that 98% of all haul times are in the interval from $8.46 - c$ to $8.46 + c$?
 - e. If four haul times are independently selected, what is the probability that at least one of them exceeds 10 min?
39. The defect length of a corrosion defect in a pressurized steel pipe is normally distributed with mean value 30 mm and standard deviation 7.8 mm [suggested in the article **“Reliability Evaluation of Corroding Pipelines Considering Multiple Failure Modes and Time-Dependent Internal Pressure” (J. Of Infrastructure System, 2012: 216-224)**].
- a. What is the probability that defect length is at most 20 mm? Less than 20 mm?
 - b. What is the 75th percentile of the defect length distribution---that is, the value that separates the smallest 75% of all lengths from the largest 25%?
 - c. What is the 15th percentile of the defect length distribution?
 - d. What values separate the middle 80% of the defect length distribution from the smallest 10% and the largest 10%?