P4:

The mileage (in thousands of miles) which car owners get with a certain kind of tyres is a random variable having probability density function

$$f(x) = \begin{cases} \frac{1}{10} e^{-\frac{x}{10}} & , \quad x > 0 \\ 0 & , \quad otherwise \end{cases}$$

Find the probability that one of these tyres will last

i) at most 5,000 miles.

ii) anywhere from 8,000 to 12,000 miles.

Solution:

Let X represents the mileage in thousands of miles

i) $P(X \leq 5) = F(5) = 1 - e^{-\frac{5}{10}} = 1 - e^{-\frac{1}{2}} = 1 - 0.6065 = 0.3935$

ii) $P(8 < X < 12) = F(12) - F(8) = e^{-0.8} - e^{-1.2} = 0.148$