

MA205 - Integral Calculus

Lesson 16: Probability and Statistics

1. What are some examples of continuous random variables?

2. Let x be a continuous random variable representing the lifetime of a laptop. Equipment failure times commonly follow an exponential probability density function (PDF). Analysts have determined an accurate PDF for the batteries, given below.

$$f(x) = \begin{cases} 0, & \text{if } x < 0 \\ 0.25e^{-0.25x}, & \text{if } x \geq 0. \end{cases}$$

(a) What is the probability that a random laptop will last in between 3 and 5 years?

(b) What is the probability that a random laptop will last *at most* 3 years?

(c) In terms of probability, what does this represent? $\int_4^{\infty} f(x) dx$

3. It turns out there are convenient ways to calculate the average and median of a random variable (see page 578 and 579).

(a) Given the same situation as above, find the average lifetime of a laptop (you will need Mathematica).

(b) The *median* of the PDF is the number of years m such that half the laptops will last at most that long (with the other half lasting at least that long). Set up an equation to determine the median, then calculate it.

4. Do problem 4 in the Mechanics Based Problems of Lesson 16 in your student guide.