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DEPARTMENT OF MATHEMATICS

Continuous Random Variable :

A random variable 'X' is called a continuous random vaniable if it takes all possible values in a given interval.

Examples : Age , Height and Weight

Distribution function (or) Cumulative Distribution function of the random Variable X:

The C.D.F of a Continuous random variable X is defined as,

$$F(x) = P(x \le x) = \int_{-\infty}^{\infty} f(x) dt dx$$

Probability Density function: (P.D.f)

Let X be a Continuous random Variable. The function f(x) is called the p.d.f of the random Variable X if it satisfies the following Conditions:

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(i) $f(x) \ge 0$, $-\infty \le x \le \infty$ (ii) $\int_{-\infty}^{\infty} f(x) dx = 1$

Remark:

1.
$$P(a \le x \le b) = P(a \le x \le b) = \int_{a}^{\infty} f(x) dx$$

2. $P(x > a) = \int_{a}^{\infty} f(x) dx$
3. $P(x \ge a) = \int_{a}^{a} f(x) dx$
 $-\infty$
4. $P(x \ge a | x > b) = \frac{P(x \ge a)}{P(x \ge a)}$

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(+) If 'x' is a Continuous random Variable whose p.d.f is given by, $f(x) = \begin{cases} C(4x - 2x^2), 0 \le x \le 2\\ 0, \text{ otherwise} \end{cases}$ Find (a) What is the value of 'c'? (b) Find P(x >1) Solution : (a) Given: $f(x) = \begin{cases} c(4x - 2x^2), 0 < x < 2 \\ 0, 0 \end{cases}$, otherwise $\int f(x) dx = 1$ $\int C(4x-ax^2) dx = 1$ $C \left[\frac{4}{2} \frac{\chi^2}{a^2} - 2 \frac{\chi^3}{3} \right]^2 d = 1$ $C \int 2(2^2) - \frac{2}{2}(2^3) = 1$ $C\left[\frac{8-\frac{16}{3}}{3}\right]=1 \implies C\left(\frac{24-16}{3}\right)=1$ $C\left(\frac{8}{3}\right) = 1$ $C = \frac{3}{8}$ Put $C = \frac{3}{2}$ in O, $f(x) = \begin{cases} \frac{3}{8} (4x - 2x^2), & 0 < x < 2 \\ 0, & 0 \end{cases}$



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(b)
$$P(x > i) = \int_{1}^{\infty} f(x) dx$$

$$= \int_{1}^{2} f(x) dx + \int_{2}^{\infty} f(x) dx$$

$$= \int_{1}^{2} \frac{3}{8} (4x - 2x^{2}) dx + 0$$

$$= \frac{3}{8} \cdot x \cdot 2 \int_{1}^{2} (2x - x^{2}) dx$$

$$= \frac{3}{4} \left[2 \frac{x^{2}}{2} - \frac{x^{3}}{3} \right]_{1}^{2}$$

$$= \frac{3}{4} \left[(4 - i) - \frac{1}{3} (8 - i) \right]$$

$$= \frac{3}{4} \left[3 - \frac{7}{3} \right] = \frac{3}{4} \left[\frac{9 - 7}{5} \right] \leq \frac{2}{4} = \frac{1}{2}$$

$$\boxed{P(x > i) = \frac{1}{2}}$$

(5) The amount of time, in hours, that a Computer functions before breaking down is a Continuous random Variable with Probability density function given by,

$$f(x) = \int \lambda e^{-\chi/100}, \ \chi \ge 0$$

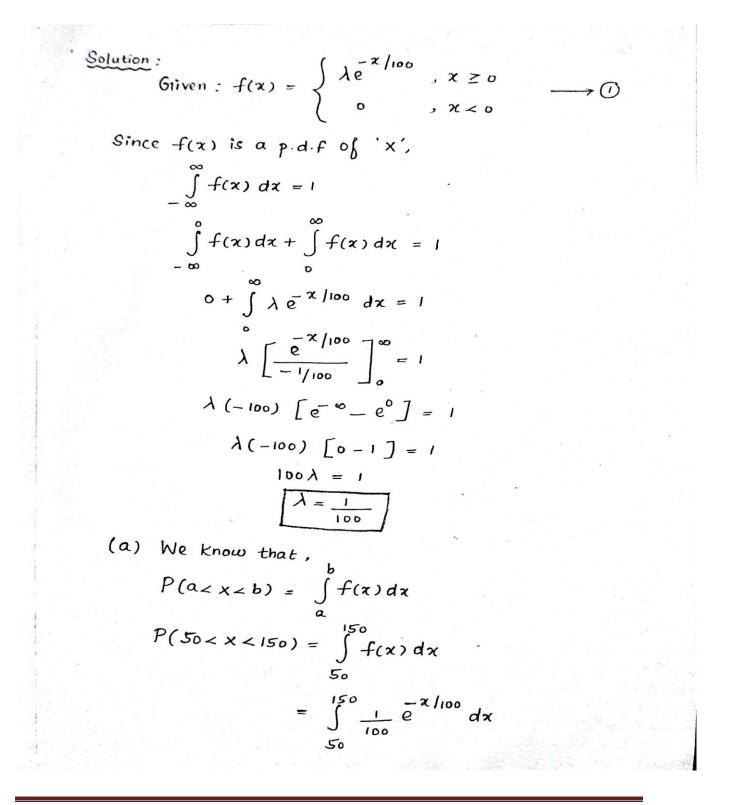
What is the probability that (a) a computer will function between 50 and 150 hrs, before breaking down (b) it will function less than 500 hours





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