

Integral Calculus: Homework (due: March 27 before class)

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1. A continuous random variable X is given by the following probability density function

$$f(x) = \begin{cases} \frac{1}{4} + \frac{1}{2}|x| & \text{if } -1 \leq x \leq 1 \\ 0 & \text{otherwise} \end{cases}$$

- (a) Find the expected value $E(X)$ of the random variable X
- (b) Let $F(x)$ be the cumulative distribution function for the random variable X . Find $F(x)$ for $0 < x < 1$.
2. Is there any value of k for which the function f below is a probability density function?

$$f(x) = \begin{cases} \frac{2k}{(k+x)(k-x)} & \text{for } 0 \leq x \leq \frac{1}{2} \\ 0 & \text{otherwise} \end{cases}$$

If yes, find all such values of k . If there is no such k , explain why.

3. Do the following series converge or diverge?

(a) $\sum_{n=0}^{\infty} \frac{1}{\sqrt{n}\sqrt{n+1}}$

(b) $\sum_{n=3}^{\infty} \left(\frac{-1}{5}\right)^n$

(c) $\sum_{n=10}^{\infty} \cos(\pi n)$