

ECE302F Lecture Groups 101 and 102 – Quiz 2

Rules:

- No books or aid sheets of any sort allowed;
 - Non-programmable electronic calculators CAN be used;
 - Total duration of quiz: 30 minutes;
 - Answer all questions.
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1. Consider the random variable X with probability density function $f_X(x)$ given by

$$f_X(x) = Ke^{-\lambda|x|}, \quad \lambda > 0, \quad -\infty < x < \infty$$

where K is a constant and $|x|$ denotes the magnitude of the real number x i.e.

$$|x| = \begin{cases} -x & \text{if } x \leq 0 \\ x & \text{if } x > 0. \end{cases}$$

- (a) Find K such that $\int_{-\infty}^{\infty} f_X(x)dx = 1$; (1 point)
- (b) Plot the resulting pdf; (1 point)
- (c) Find $F_X(x)$, the cumulative distribution function; (2 points)
- (d) Let event A be defined as $\{0 \leq X \leq 1/\lambda\}$. Find $P[A]$; (1 point)
- (e) Find $F_X(x | A)$, the conditional cdf of X given event A . Recall that $F_X(x | A) = P[\{X \leq x\} \cap A] / P[A]$; (2 points)
- (f) Find $f_X(x | A)$, the conditional pdf of X given A . (1 point)
2. Let $f_X(x)$ be the probability density function of X . Define $Y = |X|$. Find $f_Y(y)$ in terms of $f_X(x)$. (2 points)