

Assignment Sheet 3

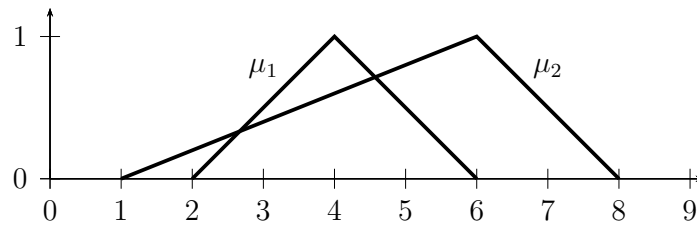
Assignment 9 Characteristic Function

What is the characteristic function of the set $E = \{x \mid x \neq x\}$?

Assignment 10 α -cuts

Compute the sets of α -cuts for both

- a) the two fuzzy sets μ_1 and μ_2 given by their graphs as follows



and

- b) the fuzzy set defined as follows

$$\mu(x) = \begin{cases} 1 - (x - 2)^2, & \text{if } 1 \leq x \leq 3 \\ 0, & \text{otherwise.} \end{cases}$$

Assignment 11 Representation of Fuzzy Sets

Let $(A_\alpha)_{\alpha \in [0,1]}$ be the system of sets defined by

$$A_\alpha = \begin{cases} [1 - \sqrt{\ln \frac{1}{\alpha}}, 1 + \sqrt{\ln \frac{1}{\alpha}}], & \text{if } \alpha > 0 \\ \mathbb{R}, & \text{if } \alpha = 0. \end{cases}$$

- a) Show that this system of sets satisfies the conditions that are satisfied by the set of α -cuts of a fuzzy set (as stated in a theorem of the lecture), *i.e.*

- (i) $[\mu]_0 = U$, where $U = \mathbb{R}$ in this case,
- (ii) $\forall \alpha, \beta : \alpha \leq \beta \Rightarrow [\mu]_\alpha \supseteq [\mu]_\beta$,
- (iii) $\forall \beta \in [0, 1] : \bigcap_{\alpha < \beta} [\mu]_\alpha = [\mu]_\beta$.

- b) Find the membership function μ of the fuzzy set that corresponds to this system of sets.