

Conversions of representations of fuzzy sets, fuzzy negations, fuzzy complements

Exercise 4.1 Fuzzy set C is given by its collection of cuts:

$$\mathcal{R}_C(\alpha) = \begin{cases} \mathbb{R}, & \alpha = 0, \\ (\alpha, 6 - 2\alpha^2), & \alpha \in (0, 1]. \end{cases}$$

Find its vertical representation.

Exercise 4.2

Find for which λ the formula

$$\neg_{\lambda} \alpha = 1 - \sqrt{1 - (1 - \alpha)^{\lambda}}$$

defines a fuzzy negation $\neg_{\lambda}$. Draw a graph.

Exercise 4.3

Fuzzy set A has the following vertical representation:

$$\mu_A(x) = \begin{cases} \frac{x-1}{2}, & x \in [1, 3], \\ 1, & x \in [3, 6], \\ 4 - \frac{x}{2}, & x \in [6, 8], \\ 0, & \text{otherwise.} \end{cases}$$

Find its fuzzy complement with respect to

1. the standard negation,
2. the negation $\neg_{\lambda}$ from the preceding exercise.