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Winter Term 2009/2010

Random Fields II
Exercise Sheet 8

for the Exercises on February 5th from 12.00 - 2.00pm in Room 220

Exercise 1 Consider the random polynomial $P = \{P(x),\, x \in \mathbb{R}\}$ which is given by

$$P(x) = \frac{1}{4}cx^2 + bx + c,$$

where b and c are iid random variables. Calculate the expectation value of the number of real roots of P if

(a) $b, c \sim \mathcal{N}(0, 1)$.

(b) $b, c \sim \mathrm{Exp}(\lambda)$, $\lambda > 0$.

(c) $b, c \sim \mathrm{U}([0, 1])$.

Exercise 2 Determine the probability density function of the (random) local extreme value H of the random polynomial P from Exercise 1 in the case of

(a) $b, c \sim \mathcal{N}(0, 1)$.

(b) $b, c \sim \mathrm{Exp}(\lambda)$, $\lambda > 0$.

(c) $b, c \sim \mathrm{U}([0, 1])$.

Exercise 3 Calculate the expectation value $\mathbf{E}P(x)$ and the variance $\mathbf{var}P(x)$ for a point $x \in \mathbb{R}$. At which point $x \in \mathbb{R}$ does P have minimum variance?