LMU Munich
Winter term 2016/17

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Exercises on Mathematical Statistical Physics II
Sheet 9

Problem 1 (Markov's Inequality with the Sixth Moment)
Show that for any Lipschitz continuous function f

$$\mathbb{P}\left(\left|\frac{1}{N-1}\sum_{j=2}^{N} f(x_1 - x_j) - f \star_q \rho(x_1)\right|_\infty \geq \varepsilon\right) \leq \frac{C}{N^3\varepsilon^6}.$$

Use this estimate to get a better control of

$$\mathbb{E}(|X^t - \overline{X}^t|_\infty)$$

Problem 2 (Two Boundary Conditions)

Let $J_t := \min\{1, \max\{f(t), g(t)\}\}$. Consider the time derivative of $\mathbb{E}(J_t)$. What boundary conditions do you get for seeking a Grönwall type estimate (see class)?

Problem 3 (Expectation Value - Probability)

Show, that for any random variable X with $\mathbb{E}(|X|) < \infty$

$$\mathbb{E}(|X|) = \int_0^\infty \mathbb{P}(|x| > a)da$$

The solutions to these exercises will be discussed on Friday, 27.01.2017.