

Werk

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$$\begin{aligned}
&\leq \frac{1}{p!} \left(\frac{p+1}{t} \right)^{p+1} \int_0^\infty e^{-((p+1)/t)\tau} \tau^p \|f(\tau) - f(t)\| d\tau = \\
&= \frac{1}{p!} \left(\frac{p+1}{t} \right)^{p+1} \int_{Z_{t,p}} e^{-((p+1)/t)\tau} \tau^p \|f(\tau) - f(t)\| d\tau + \\
&+ \frac{1}{p!} \left(\frac{p+1}{t} \right)^{p+1} \int_{R \setminus Z_{t,p}} e^{-((p+1)/t)\tau} \tau^p \|f(\tau) - f(t)\| d\tau \leq \\
&\leq \frac{1}{p!} \left(\frac{p+1}{t} \right)^{p+1} \int_{Z_{t,p}} e^{-((p+1)/t)\tau} \tau^p d\tau \sup_{\tau \in Z_{t,p}} (\|f(\tau) - f(t)\| + \\
&+ \frac{1}{p!} \left(\frac{p+1}{t} \right)^{p+1} \int_{R \setminus Z_{t,p}} e^{-((p+1)/t)\tau} \tau^p d\tau \|f(t)\| + \\
&+ \frac{1}{p!} \left(\frac{p+1}{t} \right)^{p+1} \int_{R \setminus Z_{t,p}} e^{-((p+1)/t)\tau} \tau^p \|f(\tau)\| d\tau \leq \\
&= \frac{1}{p!} \left(\frac{p+1}{t} \right)^{p+1} \int_0^\infty e^{-((p+1)/t)\tau} \tau^p d\tau \sup_{\tau \in Z_{t,p}} (\|f(\tau) - f(t)\| + \\
&+ \frac{1}{p!} \left(\frac{p+1}{t} \right)^{p+1} \int_{R \setminus Z_{t,p}} e^{-((p+1)/t)\tau} \tau^p d\tau \|f(t)\| + \\
&+ M \frac{1}{p!} \left(\frac{p+1}{t} \right)^{p+1} \int_{R \setminus Z_{t,p}} e^{-((p+1)/t - \omega)\tau} \tau^p d\tau = \\
&= \sup_{\tau \in Z_{t,p}} (\|f(\tau) - f(t)\|) + \frac{1}{\sqrt{(p+1)}} \|f(t)\| + M \frac{1}{\sqrt{(p+1)}} e^{7\omega t}
\end{aligned}$$

for every $t \in R^+$ and $p \in \{0, 1, \dots\}$ such that $p+1 > 2\omega t$.

It is clear that (1), (2) and (3) give the desired result.

A.4. Remark. The proof of Proposition A. 3 was inspired by a fascinating idea of W. Feller who used a probabilistic approach based on Chebyshev's inequality — see Chap. VII of [2].

Reference

- [1] Sova, M.: Linear differential equations in Banach spaces, *Rozprawy Československé akademie věd, Řada mat. a přír. věd*, 85 (1975), No 6.
- [2] Feller, W.: *An Introduction to Probability Theory and Its Applications*, Vol. II, 1966.

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