Anna Kamińska (kaminska@memphis.edu) Department of Mathematical Sciences, The University of Memphis, Memphis, TN 38152, USA, ***Geometric properties of Lorentz spaces and applications to approximation theory.***

ABSTRACT. Let L^0 be a space of all Lebesgue measurable extended real valued functions defined over $[0,\alpha)$, where $0<\alpha\le\infty$. Let $0<p<\infty$ and w be a measurable non-negative weight function. The *Lorentz space* $\Gamma_{p,w}$ is a subspace of L^0 such that

$$\|f\|_{\Gamma_{p,w}} := \left(\int_0^\alpha f^{**p} w\right)^{1/p} < \infty, \quad f\in\Gamma_{p,w}.$$

Recall that $f^{**}(t)=(1/t)\int_0^t f^*$, where f^* is a decreasing rearrangement of f. The functional $\|\cdot\|_{\Gamma_{p,w}}$ is a quasi-norm, and for $1\le p<\infty$ it is a norm in $\Gamma_{p,w}$.

We present the formulas of Gâteaux derivatives in the Lorentz spaces $\Gamma_{p,w}$, $1\le p<\infty$. We apply these formulas to the best constant approximation and consequently we state various types of the Lebesgue Differentiation Theorems in $\Gamma_{p,w}$. We extend the best constant approximant operator from the Lorentz spaces $\Gamma_{p,w}$ to $\Gamma_{p-1,w}$ for any $1<p<\infty$ and from $\Gamma_{1,w}$ to the space L_0. This extension allows us to state a generalization of the Lebesgue Differentiation Theorems in $\Gamma_{p-1,w}$ as well as in L_0.

This is a joint work with Maciej Ciesielski from the University of Memphis.