



POLISH NATIONAL AGENCY  
FOR ACADEMIC EXCHANGE



STER  
PROGRAMME

<p>name of the unit:</p> <p style="text-align: center;"><b>FUNCTIONAL INEQUALITIES AND THEIR APPLICATION</b></p> <p style="text-align: center;">Institute of Mathematics, Lodz University of Technology</p>		<p>symbol:</p> <p style="text-align: center;"><b>I-73</b></p> <p style="text-align: center;"><a href="https://im.p.lodz.pl/pl/">https://im.p.lodz.pl/pl/</a></p>
<p>head of the unit:</p> <p style="text-align: center;">Prof. dr hab. Marek Balcerzak</p>	<p>potential promoters:</p> <p style="text-align: center;">Dr hab. Włodzimierz Fechner</p>	<p>contact person:</p> <p style="text-align: center;">Dr hab. Włodzimierz Fechner</p> <p style="text-align: center;">tel: 42-631-38-54</p> <p style="text-align: center;"><a href="mailto:wlodzimierz.fechner@p.lodz.pl">wlodzimierz.fechner@p.lodz.pl</a></p>
<p>scope of activities:</p> <p>Main areas of interest and directions of scientific research:</p> <ul style="list-style-type: none"> <li>• Classical functional inequalities for different classes of functions</li> <li>• Convexity and its generalizations</li> <li>• Applications of functional equations and inequalities, particularly in areas such as game theory and fuzzy reasoning</li> </ul>		<p>graphic material</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 10px; text-align: center;"> <math display="block">T(f + T(g)) \leq T(f) + T(g).</math> </div> <div style="border: 1px solid black; padding: 10px; text-align: center;"> <math display="block">T(z, x)I = ((z, \eta)I, I(x, z))I</math> </div> </div>
<p>present activities:</p> <p>The scope of our research activity includes contemporary problems in the theory of functional equations and inequalities. We place emphasis on the application of the obtained results. We study Sincov's multiplicative inequality and similar inequalities and their relationship to some problems in game theory. Our results describe a form of solutions, which in turn leads to answers to questions about the Nash equilibrium points in the studied stochastic two-player or multiplayer games. We are also interested in fuzzy implications, where Sincov's functional equation appears on a truncated domain.</p>		
<p>Future activities:</p> <p>Continuation of the conducted research, extending the scope of the studied problems.</p>		
<p>Publications/patents, awards, projects:</p> <p>W. Fechner, Z. Páles, Convexity properties of functions defined on metric Abelian groups, <i>Aequationes Mathematicae</i> 95/3 (2021), 449-481.</p> <p>A. Bartoszewicz, W. Fechner, A. Świątczak, A. Widz, On the <math>c_0</math>-equivalence and permutations of series, <i>Annals of Functional Analysis</i> 12/2 (2021), 1-10.</p> <p>W. Fechner, Z. Páles, Convexity of sets in metric Abelian groups, <i>Forum Mathematicum</i> 32/6 (2020), 1477-1486</p> <p>W. Fechner, Richard's inequality, Cauchy-Schwarz's inequality, and approximate solutions of Sincov's equation, <i>Proceedings of the American Mathematical Society</i> 147/9 (2020), 3955-3960.</p> <p>W. Fechner, Á. Szász, Composition iterates, Cauchy, translation, and Sincov inclusions, <i>Acta Universitatis Sapientiae, Mathematica</i> 12/1 (2020), 54-84.</p>		



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Graduate of dr hab. W. Fechner, Maria Słomian, MA is the winner of the Marian Rejewski competition for the award of the director of the Institute of Mathematics for the best master's thesis in the field of Applied Mathematics in the 2020/21 academic year. The work is part of the presented research project.

**Keywords:**

functional inequality, functional equation, convexity, stochastic binary game, fuzzy implication

**List of internship proposal in this research team:**

Scientific cooperation in a selected area of research or related topics.