148. *Proposed by D.M. Bătineţu-Giurgiu, "Matei Basarab" National College, Bucharest, Romania, and Neculai Stanciu, "George Emil Palade" School, Buzău, Romania.* Find

$$\lim_{x\to\infty}\left(x^{\cosh^2(t)}\left((\Gamma(x+1))^{\frac{-\sinh^2(t)}{x}}-(\Gamma(x+2))^{\frac{-\sinh^2(t)}{x+1}}\right)\right),$$

where $t\in\mathbb{R}$ and Γ is the Gamma function.

149. *Proposed by Arkady Alt, San Jose, California, USA.* Let D be set of strictly decreasing sequences of positive real numbers with first term equal to 1. For given real positive p,r and any $x_{\mathbb{N}}=(x_1,x_2,...,x_n,...)\in D$. Let $S\left(x_{\mathbb{N}}\right)=\sum_{n=1}^{\infty}\dfrac{x_n^{p+q}}{x_{n+1}^{p}}$ if series $\sum_{n=1}^{\infty}\dfrac{x_n^{p+r}}{x_{n+1}^{p}}$ converges and $S\left(x_{\mathbb{N}}\right)=\infty$ if it diverges. Find $\inf\left\{S\left(x_{\mathbb{N}}\right)\mid x_{\mathbb{N}}\in D\right\}$.

150. *Proposed by Cornel Ioan Vălean, Timiş, Rumania.* Find

$$\sum_{k=1}^{\infty}\sum_{n=1}^{\infty}(-1)^{k+n}\frac{H_{k+n}^3}{k+n},$$

where $H_n=1+\dfrac{1}{2}+\cdots+\dfrac{1}{n}$ denotes the nth harmonic number.

151. *Proposed by Albert Stadler, Herrliberg, Switzerland.* Prove that

$$\sum_{n=1}^{\infty}\frac{1}{n}\sum_{k=n}^{\infty}\frac{1}{1+k^2}=\left(\frac{3}{2}+\frac{\pi}{2}\coth\pi\right)\sum_{k=1}^{\infty}\frac{1}{k(1+k^2)}-\sum_{k=1}^{\infty}\frac{1}{k(1+k^2)^2}.$$