**JP.103. Let $x, y, z > 0$ be positive real numbers. Then in triangle $ABC$ with semiperimeter $s$ and inradius $r$.**

$$\frac{x}{y+z}\cot^2\frac{A}{2}+\frac{y}{z+x}\cot^2\frac{B}{2}+\frac{z}{x+y}\cot^2\frac{C}{2}\geq 18-\frac{s^2}{2r^2}$$

*Proposed by D.M. Bătineţu – Giurgiu – Romania, Martin Lukarevski – Skopje*

**JP.104. Let $r_a, r_b, r_c$ be the exradii, $h_a, h_b, h_c$ the altitudes and $m_a, m_b, m_c$ the medians of a triangle $ABC$ with semiperimeter $s$, circumradius $R$ and inradius $r$. Then**

$$\frac{r_a^2}{h_b m_c}+\frac{r_b^2}{h_c m_a}+\frac{r_c^2}{h_a m_b}\geq\frac{54r^2}{s^2-r^2-4Rr}$$

*Proposed by D.M. Bătineţu – Giurgiu – Romania, Martin Lukarevski – Skopje*

**JP.105. Let $m > 0$ and $F$ be the area of the triangle $ABC$. Then**

$$\frac{a^{m+2}}{b^m+c^m}+\frac{b^{m+2}}{c^m+a^m}+\frac{c^{m+2}}{a^m+b^m}\geq 2\sqrt{3}F.$$

*Proposed by D.M. Bătineţu – Giurgiu – Romania, Martin Lukarevski – Skopje*

# PROBLEMS FOR SENIORS

**SP.091. Prove that for all positive real numbers $a, b, c, d$**

$$\frac{a^2}{a+b+c}+\frac{b^2}{b+c+d}+\frac{c^2}{c+d+a}+\frac{d^2}{d+a+b}\geq$$
$$\geq\frac{a+b+c+d}{3}+\frac{4(2a+b-2c-d)^2}{27(a+b+c+d)}$$

*Proposed by Nguyen Viet Hung – Hanoi – Vietnam*

**SP.092. Prove that for all positive real numbers $a, b, c$**

a. $$\frac{a^2}{a+b}+\frac{b^2}{b+c}+\frac{c^2}{c+a}\geq\frac{a+b+c}{2}+\frac{(b-c)^2}{2(a+b+c)}$$

b. $$\frac{a^2}{b+c}+\frac{b^2}{c+a}+\frac{c^2}{a+b}\geq\frac{a+b+c}{2}+\frac{(a+b-2c)^2}{2(a+b+c)}$$

*Proposed by Nguyen Viet Hung – Hanoi – Vietnam*

**SP.093. Prove that in any triangle $ABC$ the following inequality holds**

$$\frac{(b+c)a}{m_a^2}+\frac{(c+a)b}{m_b^2}+\frac{(a+b)c}{m_c^2}\geq 8$$

*Proposed by Nguyen Viet Hung – Hanoi – Vietnam*