

# ROMANIAN MATHEMATICAL MAGAZINE

In acute triangle  $ABC$  holds:

$$\sum_{cyc} \tan B \tan C \geq 3 + \sum_{cyc} \sqrt{1 + \tan^2 A}$$

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Let  $x := \tan A$ ,  $y := \tan B$ ,  $z := \tan C$ . We have  $x, y, z > 0$  and  $x + y + z = xyz$ .

By AM – GM inequality we have

$$\begin{aligned} 3 + \sum_{cyc} \sqrt{1 + x^2} &= 3 + \sum_{cyc} \sqrt{1 + \frac{x(x + y + z)}{yz}} = \\ &= 3 + \sum_{cyc} \sqrt{\frac{(x + y)(x + z)}{yz}} \leq 3 + \sum_{cyc} \frac{y + z}{x} = \sum_{cyc} x \cdot \sum_{cyc} \frac{1}{x} = \sum_{cyc} yz, \end{aligned}$$

as desired. Equality holds iff  $\Delta ABC$  is equilateral.