3088. *Proposed by Christopher J. Bradley, Bristol, UK.*

Let ABC be a triangle and P a point in the plane of this triangle, not lying on any of the three lines determined by its sides. Let AD, BE, and CF be the Cevians through the point P. The lines through A parallel to BE and CF meet the line BC at L and L', respectively. Points M, M', N, and N' are similarly defined. Prove that L, L', M, M', N, N' all lie on a conic.

3089. *Proposed by Christopher J. Bradley, Bristol, UK.*

Let ABC be a triangle and P a point in the plane of this triangle, not lying on any of the three lines determined by its sides. Let AD, BE, and CF be the Cevians through the point P. The lines through E and F parallel to AD meet the line BC at L and L', respectively. Points M, M', N, and N' are similarly defined. Prove that L, L', M, M', N, N' all lie on a conic.

3090. *Proposed by Arkady Alt, San Jose, CA, USA.*

Find all non-negative real solutions (x, y, z) to the following system of inequalities:

$$\begin{aligned} 2x(3-4y) &\geq z^2+1\,, \\ 2y(3-4z) &\geq x^2+1\,, \\ 2z(3-4x) &\geq y^2+1\,. \end{aligned}$$

3091. *Proposed by Mihály Bencze and Marian Dinca, Romania.*

Let $A_1A_2\cdots A_n$ be a convex polygon which has both an inscribed circle and a circumscribed circle. Let $B_1, B_2, \ldots, B_n$ denote the points of tangency of the incircle with sides A_1A_2, A_2A_3, $\ldots$, A_nA_1, respectively. Prove that

$$\frac{2sr}{R} \;\leq\; \sum_{k=1}^{n} B_kB_{k+1} \;\leq\; 2s\cos\left(\frac{\pi}{n}\right)\,,$$

where R is the radius of the circumscribed circle, r is the radius of the inscribed circle, s is the semiperimeter of the polygon $A_1A_2\cdots A_n$, and $B_{n+1} = B_1$.

3092. *Proposed by Vedula N. Murty, Dover, PA, USA.*

(a) Let a, b, and c be positive real numbers such that $a+b+c = abc$. Find the minimum value of $\sqrt{1+a^2}+\sqrt{1+b^2}+\sqrt{1+c^2}$.

[Compare with ***CRUX with MAYHEM*** problem 2814 [2003 : 110; 2004 : 112].]

(b) Let a, b, and c be positive real numbers such that $a+b+c = 1$. Find the minimum value of

$$\frac{1}{\sqrt{abc}} + \sum_{\text{cyclic}} \sqrt{\frac{bc}{a}}\,.$$