PROBLEMS AND SOLUTIONS

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This section contains problems intended to challenge students and teachers of college mathematics. We urge you to participate actively BOTH by submitting solutions and by proposing problems that are new and interesting. To promote variety, the editors welcome problem proposals that span the entire undergraduate curriculum.

Proposed problems should be sent to **Curtis Cooper**, either by email as a pdf, TEX, or Word attachment (preferred) or by mail to the address provided above. Whenever possible, a proposed problem should be accompanied by a solution, appropriate references, and any other material that would be helpful to the editors. Proposers should submit problems only if the proposed problem is not under consideration by another journal.

Solutions to the problems in this issue should be sent to **Shing So**, either by email as a pdf, TEX, or Word attachment (preferred) or by mail to the address provided above, no later than April 15, 2012.

PROBLEMS

966. *Proposed by Tahani Fraiwan and Mowaffaq Hajja, Yarmouk University, Irbid, Jordan.*

Let P be a point in a plane of $\triangle ABC$ which is not on the sidelines AB, AC, or BC and let cevians AA', BB', CC' of triangle ABC intersect at P. Show that triangles $B'A'C$ and $A'C'B$ have the same orientation and equal areas if and only if A' is a midpoint of BC.

967. *Proposed by Elias Lampakis, Kiparissia, Greece.*

A point (x, y) on the plane with both coordinates x, y rational is called rational else, it is called irrational. Let $n \geq 2$ be a positive integer and $C(\mathbb{Q})$ be the set of rational points on the parabola $C : y^2 = 4x$. Prove that the tangent lines to C at every $(x, y) \in C(\mathbb{Q}) - \{(0, 0)\}$ intersect the curve $K : y = x^n$ at irrational points.

968. *Proposed by Greg Oman, The University of Colorado, Colorado Springs, Colorado Springs, CO.*

Let $C(\mathbb{R})$ be the ring (under pointwise addition and multiplication) of continuous functions $f : \mathbb{R} \to \mathbb{R}$. Suppose that S is a subring (not necessarily with 1) of $C(\mathbb{R})$ which contains only monotone functions (the monotonicity need not be strict). Must every member of S be a constant function? Prove or provide a counterexample.

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