PROBLEMS AND SOLUTIONS

EDITORS

Curtis Cooper
CMJ Problems
Department of Mathematics and Computer Science
University of Central Missouri
Warrensburg, MO 64093
email: cooper@ucmo.edu

Charles N. Curtis
CMJ Solutions
Mathematics Department
Missouri Southern State University
3950 Newman Road
Joplin, MO 64801
email: curtis-c@mssu.edu

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 (preferred) as a pdf, TEX, or Word attachment 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 **Chip Curtis**, either by email as a pdf, TEX, or Word attachment (preferred) or by mail to the address provided above, no later than May 15, 2016.

PROBLEMS

1066. *Proposed by George Apostolopoulos, Messolonghi, Greece.*

Let a, b, c be the lengths of the sides of a triangle ABC with inradius r and circumradius R. Prove that

$$(a+b)\tan\frac{C}{2}+(b+c)\tan\frac{A}{2}+(c+a)\tan\frac{B}{2}=4(R+r).$$

1067. *Proposed by Greg Oman, University of Colorado, Colorado Springs, CO.*

Find all (nontrivial) commutative Artinian rings R for which 1 and -1 are the only units of R.

1068. *Proposed by Spiros P. Andriopoulos, Third High School of Amaliada, Eleia, Greece.*

Let $f_1(x), f_2(x), \ldots, f_n(x)$ be continuous and positive on $[0, 1]$. Prove that

$$\int_0^1 \frac{f_1(x)}{f_2(1-x)}\,dx \cdot \int_0^1 \frac{f_2(x)}{f_3(1-x)}\,dx \cdots \int_0^1 \frac{f_n(x)}{f_1(1-x)}\,dx \geq 1.$$

1069. *Proposed by Ángel Plaza, Universidad de Las Palmas de Gran Canaria, Spain.*

Let $\{u_n\}_{n\geq 0}$ be a sequence defined recursively by $u_0 \geq 0$, $u_1 \geq 0$, and $u_{n+1} = \sqrt{u_n \cdot u_{n-1}}$, for $n \geq 1$. Determine $\lim_{n\to\infty} u_n$ in terms of u_0, u_1.

http://dx.doi.org/10.4169/college.math.j.47.1.61