Problems Ted Eisenberg, Section Editor

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This section of the Journal offers readers an opportunity to exchange interesting mathematical problems and solutions. Please send them to Ted Eisenberg, Department of Mathematics, Ben-Gurion University, Beer-Sheva, Israel or fax to: 972-86-477-648. Questions concerning proposals and/or solutions can be sent e-mail to <eisenbt@013.net>. Solutions to previously stated problems can be seen at <http://www.ssma.org/publications>.

Solutions to the problems stated in this issue should be posted before
April 15, 2016

- **5385:** *Proposed by Kenneth Korbin, New York, NY*

  A triangle with integer length sides and integer area has perimeter $P = 6^6$. Find the sides of the triangle when the area is minimum.

- **5386:** *Proposed by Michael Brozinsky, Central Islip, NY.*

  Determine whether or not there exit nonzero constants a and b such that the conic whose polar equation is
  $$r = \sqrt{\frac{a}{\sin(2\theta) - b\cos(2\theta)}}$$
  has a rational eccentricity.

- **5387:** *Proposed by Arkady Alt, San Jose, CA*

  Let $D := \{(x,y) \mid x, y \in R_+,\ x \neq y \text{ and } x^y = y^x\}$.(Obviously $x \neq 1$ and $y \neq 1$).
  Find $\sup\limits_{(x,y)\in D} \left(\dfrac{x^{-1}+y^{-1}}{2}\right)^{-1}$

- **5388:** *Proposed by Jiglău Vasile, Arad, Romania*

  Let $ABCD$ be a cyclic quadrilateral, R and r its exradius and inradius respectively, and a, b, c, d its side lengths (where a and c are opposite sides.) Prove that
  $$\frac{R^2}{r^2} \geq \frac{a^2c^2}{b^2d^2} + \frac{b^2d^2}{a^2c^2}.$$

- **5389:** *Proposed by José Luis Díaz-Barrero, Barcelona Tech, Barcelona, Spain*

  Let ABC be a scalene triangle with semi-perimeter s and area $\mathcal{A}$. Prove that
  $$\frac{3a+2s}{a(a-b)(a-c)} + \frac{3b+2s}{b(b-a)(b-c)} + \frac{3c+2s}{c(c-a)(c-b)} < \frac{3\sqrt{3}}{4\mathcal{A}}.$$