

## Title

SAVA GROZDEV<sup>a</sup>, HIROSHI OKUMURA<sup>b</sup> AND DEKO DEKOV<sup>c</sup> <sup>2</sup>

<sup>a</sup> VUZF University of Finance, Business and Entrepreneurship,  
 Gusla Street 1, 1618 Sofia, Bulgaria  
 e-mail: sava.grozdev@gmail.com

<sup>b</sup> Maebashi Gunma, 371-0123, Japan  
 e-mail: hokmr@yandex.com

<sup>c</sup>Zahari Knjazheski 81, 6000 Stara Zagora, Bulgaria  
 e-mail: ddekov@ddekov.eu  
 web: <http://www.ddekov.eu/>

**Abstract.** By using the computer program “Discoverer”, we give theorems about anticevian corner products.

**Keywords.** anticevian corner product, triangle geometry, remarkable point, computer-discovered mathematics, Euclidean geometry, Discoverer.

**Mathematics Subject Classification (2010).** 51-04, 68T01, 68T99.

### 1. INTRODUCTION

$ABC \ \mathcal{ABC} \ \text{ABC} \ \text{ABC} \ \text{ABC} \ \mathfrak{ABC} \ \overrightarrow{PQ}$

### 2. PRELIMINARIES

#### 2.1. Barycentric Coordinates.

**Definition 2.1.** *Definition.*

**Example 2.1.** *Example.*

**Lemma 2.1.** *Lemma.*

**Theorem 2.1.** *Theorem.*

*Proof.* The proof. □

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<sup>2</sup>Corresponding author

**Corollary 2.1.** *Corollary.*

**Remark.** *Remark.*

**Theorem 2.2** (Pythagorean theorem). *Theorem.*

**Theorem 2.3** (Gibert's theorem). *Theorem.*

$$(1) \quad |PQ|^2 = -a^2vw - b^2wu - c^2uv$$

where  $u = u_1 - u_2, v = v_1 - v_2$  and  $w = w_1 - w_2$ .

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where  $u = u_1 - u_2, v = v_1 - v_2$  and  $w = w_1 - w_2$ .

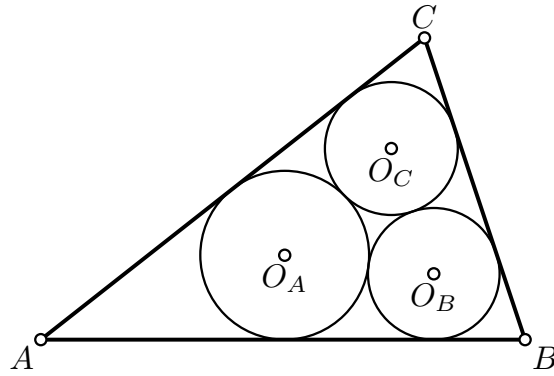


FIGURE 1. EPS figure

Determinant:

$$(2) \quad \begin{vmatrix} u_1 & v_1 & w_1 \\ u_2 & v_2 & w_2 \\ x & y & z \end{vmatrix} = 0.$$

Matrix:

$$(3) \quad A = \begin{bmatrix} u_1 & v_1 & w_1 \\ u_2 & v_2 & w_2 \\ x & y & z \end{bmatrix}$$

$$(4) \quad B = \begin{pmatrix} u_1 & v_1 & w_1 \\ u_2 & v_2 & w_2 \\ x & y & z \end{pmatrix}$$

$$\frac{a}{x} + \frac{b}{y} + \frac{c}{z\sqrt{2}} = 0.$$

## REFERENCES

- [1] Quim Castellsaguer, The Triangles Web, <http://www.xtec.cat/~qcastell/ttw/ttweng/portada.html>.
- [2] P. Douillet, *Translation of the Kimberling's Glossary into barycentrics*, 2012, v48, <http://www.douillet.info/~douillet/triangle/glossary/glossary.pdf> or <http://www.ddekov.eu/e2/htm/links/Douillet.pdf>.
- [3] B. Gibert, Cubics in the Triangle Plane, <http://bernard.gibert.pagesperso-orange.fr/index.html>.
- [4] S. Grozdev and D. Dekov, *A Survey of Mathematics Discovered by Computers*, International Journal of Computer Discovered Mathematics, 2015, vol.0, no.0, 3-20. <http://www.journal-1.eu/2015/01/Grozdev-Dekov-A-Survey-pp.3-20.pdf>.
- [5] S. Grozdev and D. Dekov, *Computer-generated mathematics: Points on the Kiepert hyperbola*, The Mathematical Gazette, vol. 98, 2014, no. 543, 509-511, <http://www.ddekov.eu/papers/Grozdev,Dekov%20Math%20Gazette,%20Nov.%202014,%20note%2098-33.pdf>.
- [6] S. Grozdev and D. Dekov, *The Computer improves the Steiner's Construction of the Malfatti Circles*, Mathematics and Informatics, 2015, vol. 58, no.1, 40-51. [http://www.azbuki.bg/editions/azbuki/archive/archive2011/doc\\_download/2240-grozdev-dekov0120](http://www.azbuki.bg/editions/azbuki/archive/archive2011/doc_download/2240-grozdev-dekov0120).
- [7] S. Grozdev and V. Nenkov, *Three Remarkable Points on the Medians of a Triangle* (Bulgarian), Sofia, Archimedes, 2012.
- [8] S. Grozdev and V. Nenkov, *On the Orthocenter in the Plane and in the Space* (Bulgarian), Sofia, Archimedes, 2012.
- [9] C. Kimberling, *Encyclopedia of Triangle Centers - ETC*, <http://faculty.evansville.edu/ck6/encyclopedia/ETC.html>.
- [10] Gerry Leversha, *The Geometry of the Triangle*, The United Kingdom Mathematical Trust, The Pathways Series no.2, 2013.
- [11] J. Tabov and B. Lazarov, *Geometric Constructions*, Sofia, Narodna Prosveta, 1990.
- [12] G. Paskalev and I. Tchobanov, *Remarkable Points in the Triangle* (in Bulgarian), Sofia, Narodna Prosveta, 1985.
- [13] G. Paskalev, *With coordinates in Geometry* (in Bulgarian), Sofia, Modul-96, 2000.
- [14] E. Weisstein, *MathWorld - A Wolfram Web Resource*, <http://mathworld.wolfram.com/>.
- [15] *Wikipedia*, <https://en.wikipedia.org/wiki/>.
- [16] P. Yiu, *Introduction to the Geometry of the Triangle*, 2001, new version of 2013, <http://math.fau.edu/Yiu/YIUIntroductionToTriangleGeometry130411.pdf>.