ZMATH 2012f.00728

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Exploring conics: why does $B^2 - 4AC$ matter?

Math. Teach. (Reston) 105, No. 7, 526-532 (2012).

Summary: The ancient Greeks studied conic sections from a geometric point of view – by cutting a cone with a plane. Later, Apollonius (ca. 262–190 BCE) obtained the conic sections from one right double cone. The modern approach to the study of conics can be considered "analytic geometry," in which conic sections are defined in terms of distance relationships or described as graphs of certain types of equations. Distance relationships involve the center of the shape, the focus or foci, the directrix, and the position of axes. Thus, the set of all points equidistant from a fixed point (the "center") makes up a circle; the set of all points in which the sum of the distances to two fixed points (the "foci") is constant makes up an ellipse; the set of all points in which the difference of the distances to two fixed points (the foci) is constant makes up a hyperbola; and the set of all points in which the distance to a fixed point (focus) is equal to the distance to a fixed line (the "directrix") makes up a parabola. In this article, the author describes how paper-folding activities using waxed paper can help students explore geometric properties of the conic sections. She also discusses how an introduction to definitions and equations of conic sections can be extended to explain the significance of the "discriminant." (ERIC)

Classification: G70
Keywords: equations; geometry; geometric concepts; mathematics instruction; manipulative materials; computer software; educational technology; conic sections
doi:10.5951/mathteacher.105.7.0526 http://www.nctm.org/publications/article.aspx?id=32203