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THE MYLAR BALLOON: AN ALTERNATIVE DESCRIPTION

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Abstract. Here we present a new parametrization of the Mylar balloon via the Weierstrassian functions which is used for the derivation of the basic geometrical characteristics of the balloon.

MSC: 49Q10, 53A05, 53A10
Keywords: Axisymmetric surfaces, balloons, Weierstrassian functions

1. The Mylar Balloon: Industrial and Geometrical

The Mylar® is a trademark of an extremely thin polyester film, which is flexible but superior inelastic – when folded it can neither stretch nor shrink. In geometry the term Mylar is the name coined by Paulsen [12] in order to designate a special surface of revolution. He called this surface "Mylar balloon", or shortly "Mylar", as it almost perfectly approaches the shape of a fully inflated balloon, made from two sewn together equal circular disks of Mylar® foil. Due to the great tensile strength of the foil, the resulting shape of the Mylar balloon is somewhat surprisingly not spherical in form and the surface area is not preserved – a fact extremely evidenced by the wrinkled area showing up along the sewn boundaries of the two disks. Such wrinkling and crimping are apparently observed for the commercially produced Mylar® balloons widely used for decoration purposes and kids toys.

The inflating of the Mylar balloon, as pictured above, clearly implies the following mathematical problem: *Find a surface of revolution, enclosing maximum volume, for a given directrice arclength.* Inflating of the balloon to the maximum and the