Differential and Integral Analysis of the Torus

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In this mathematical investigation, the characteristics and behavior of the torus was studied when differentiation and integration are applied. The purpose was to achieve a better understanding of the torus, commonly considered the “perfect shape” in nature. Found in many models, the torus is the product of a multiplication of circles; it is the product of the rotation of a circumference (r) around a fixed coplanar point (R). The hypothesis established that it is possible to apply integration and differentiation to the parametric equation that describes the surface of a torus, and the resulting equation for it would graphically manifest like a tangent plane, with the integral being the inverse of it. The derivate and integral of the parametric equation describing a toroid surface was found by establishing the angle of polar rotation (φ), the minor radius (r) and the mayor radius (R) were maintained constant, thus solving for the angle of toroid rotation (ϕ). After differentiating and integrating the torus, an online platform for graphing was used (Archimy.com) to substitute values for r and R in the resulting equations; facilitating a visual comparison of the results and their original function. The hypothesis was accepted because the resulting equations describing the derivate and integral were found, however the derivate did not describe a tangent plane as expected. A future projection would be including the second derivative, different figures described and theorized in topology, and/or variations (or topological equivalents) of the torus.