1145-M5-1295 **Philip B. Yasskin*** (yasskin@math.tamu.edu), Dept of Math, Texas A&M Univ, 3368 TAMU, College Station, TX 77843-3368. *Minimum Volume between a Surface and its Tangent Plane.*

Sometimes you need to present a Math Circle activity to older participants who already know calculus, such as high school students; a college math club; or an IBL calculus class. Here is an activity stated for Calculus 3 but also has a simpler version for Calculus 2. "Minimum Volume between a Surface and its Tangent Plane": Pick a function $z = f(x, y)$ which is everywhere concave up (or down) on the rectangle $[0, 1]\times[0, 1]$. Construct the tangent plane at a point $(p, q) \in [0, 1]\times[0, 1]$. Compute the volume, $V(p, q)$, between the surface and its tangent plane above the rectangle. Finally, find the point (p, q) which minimizes this volume. Each student should pick their own function $f(x, y)$, not the polynomial $f(x, y) = x^2 + y^2$, some concave up, some concave down. After they complete this, they will observe they all got the same answer. Surprise! They make a conjecture and prove it. Notice how this single problem incorporates most of the majors points in differential and integral calculus. They find tangent planes. (Using a general point is hard for most students.) They find volume between two graphs. They do a max/min problem. They make a conjecture and prove it. A similar problem works in Calculus 2 using a curve and its tangent line. (Received September 20, 2018)