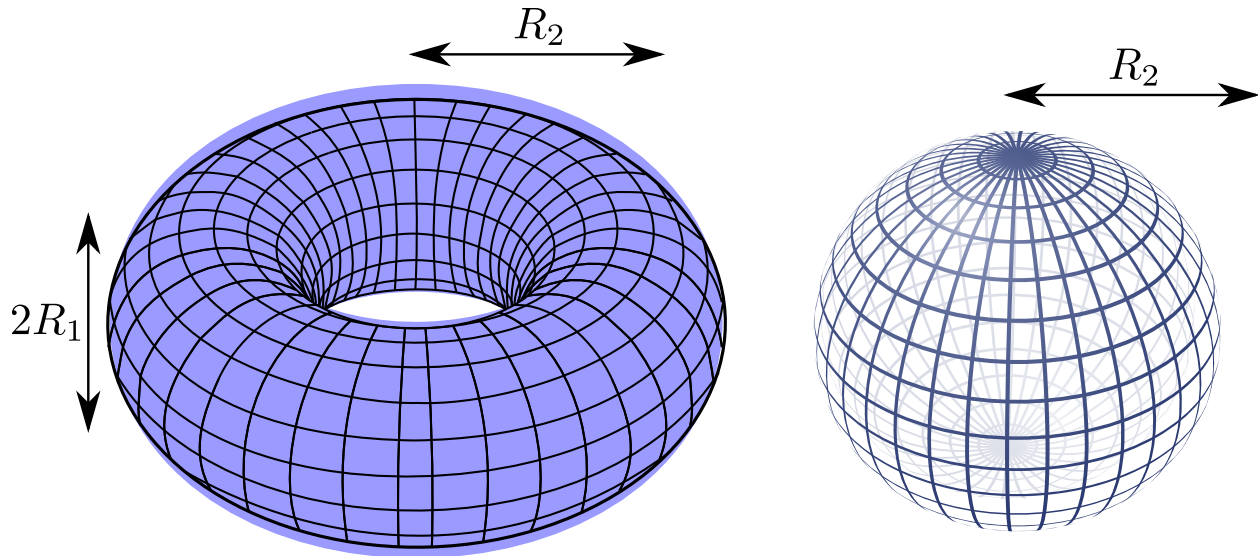


18.022 Practice Problems, 11/04/2013

Recitation Instructor: Homer Reid

1. (Colley, problem 4.2.29) What point on the plane $3x - 4y - z = 24$ is closest to the origin?
2. (A new version of the problem from last week.) Suppose you are running a donut shop. Your donut is a toroidal volume of fried dough with inner radius R_1 and outer radius R_2 (measured in centimeters). Each time you make a donut, you also make a “donut hole” (a sphere of radius R_2). You sell both the donut and the donut hole together.



The *price* at which you sell your product is proportional to the *surface area* of the donut plus the surface area of the hole. Let the price per unit surface area of your product be β (dollars per square centimeter).

On the other hand, the dough is made by an automatic bread machine that emits dough in chunks of volume $V=100$ cubic centimeters. Thus, the volume of the donut plus the volume of the donut hole is fixed at 100 cubic cm.

Given this constraint, how should you choose R_1, R_2 to maximize the surface area of the donut+donut hole?

3. (Colley problem 5.2.13) Integrate the function $f(x, y)$ over the region bounded by $x + y = 2$ and $y^2 - 2y - x = 0$.