

PS#15: More fun!!!

Nueva Multivariable Calculus

0. Read Andrew's solution notes to PS#14! Very good! And also his notes on double integrals!
1. Find the volume of the shape bounded on the top by the function $f(x, y) = xy$, and on the base/sides by the rectangle with corners at $(x = 1, y = 0)$ and $(x = 4, y = 2)$. (And the xy plane as the bottom, naturally.)

Find this volume in TWO different ways—both by making cross sections parallel to the x -axis and adding them all up, and by making cross-sections parallel to the y -axis and adding them all up. (Draw lots of pictures!!!)

2. You really love Pringles.

(I do not endorse this nutritional preference.)

As such, you're building a small house in the shape of a giant Pringle (or rather, a Pringle projected downwards to the earth—it has a hyperbolic paraboloid for a roof, and the walls/base form an ellipse). The base can be described as::

$$x(t) = 30 \cos(t)$$

$$y(t) = 20 \sin(t)$$

for t between 0 and 2π

And your roof, as a function of the x and y -coordinates, can be described by:

$$\text{roof}(x, y) = \frac{1}{400} \left(\sqrt{3}x - y \right)^2 - \frac{1}{400} \left(\sqrt{3}y + x \right)^2 + 10$$

How much paint do you need to paint the sides? How tall of a ladder do you need to paint it?