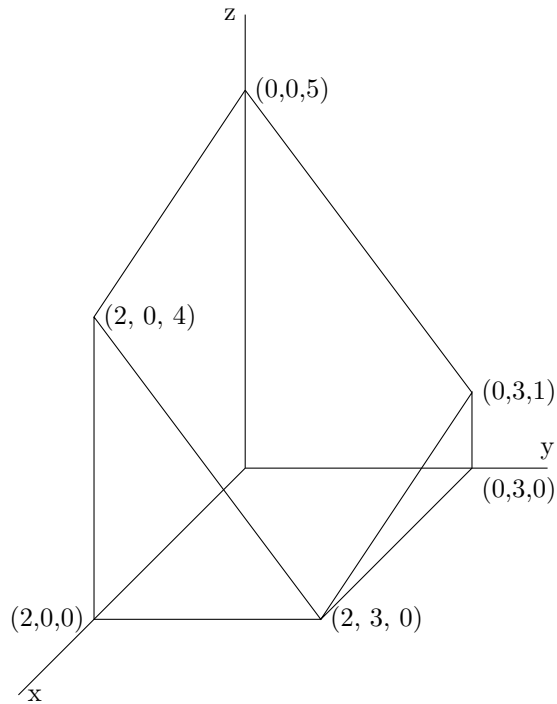0.1. **Lagrange Multipliers.** Using the method of Lagrange multipliers, find the area of the largest rectangle that can be drawn with one corner on the origin, and diagonal corner on the construct $(2x)^2 + (y)^2 = 1$.
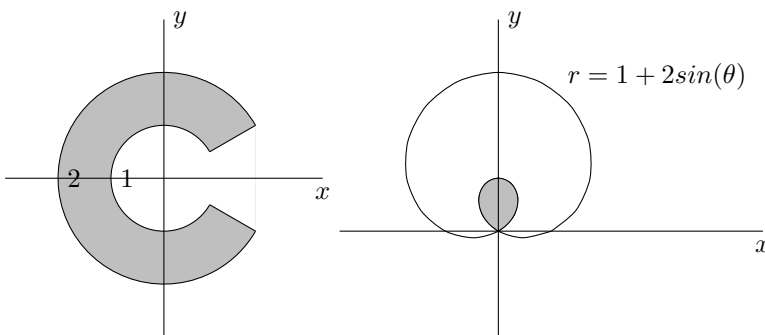
0.2. **Computing Double Integrals.** Using double integrals, find the volume of this figure:

0.3. **Setting up Double Integrals.** Set up an integral that will compute the volume of a function $f(x, y)$ over each of the following regions:
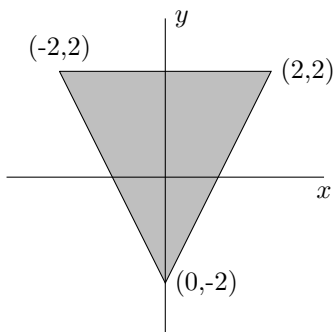
Set up an integral that will compute the volume of a function $g(r : \theta)$ over each of the following regions:

$r = 1 + 2sin(\theta)$

Bonus Problem. *Worth no points!* Can you find a set of numbers a_{ij} where $i, j \in \mathbb{N}$, so that

$$\sum_{i=1}^{\infty}\sum_{j=1}^{\infty} a_{ij} = 1$$

but

$$\sum_{j=1}^{\infty}\sum_{i=1}^{\infty} a_{ij} = 0.$$

Use these functions to describe a function $f(x, y)$ so that $\iint f dx dy \neq \iint f dy dx$. (This will be in an improper integral.)