

1 | Tiling the Pringlehouse

As a review, our pringles shaped house has the following parametres:

$$\begin{cases} x(t) = 30\cos(t) \\ y(t) = 20\sin(t) \end{cases} \quad (1)$$

and the roof is defined by:

$$r(x, y) = \frac{1}{400} (\sqrt{3}x - y)^2 - \frac{1}{400} (\sqrt{3}y - x)^2 + 10 \quad (2)$$

We will first convert the above function into rectangular bounds to take the area of.

$$x = 30\cos(t) \quad (3)$$

$$\Rightarrow \frac{x}{30} = \cos(t) \quad (4)$$

$$\Rightarrow t = \arccos\left(\frac{x}{30}\right) \quad (5)$$

Supplying this back to the original expression for y:

$$y = 20\sin\left(\arccos\left(\frac{x}{30}\right)\right) \quad (6)$$

$$= 20\sqrt{1 - \left(\frac{x}{30}\right)^2} \quad (7)$$

Therefore, the actual integral:

$$\int_{-30}^{30} \int_{-20\sqrt{1 - \left(\frac{x}{30}\right)^2}}^{20\sqrt{1 - \left(\frac{x}{30}\right)^2}} 1 dy dx \quad (8)$$

We will endeavor now to use technology.