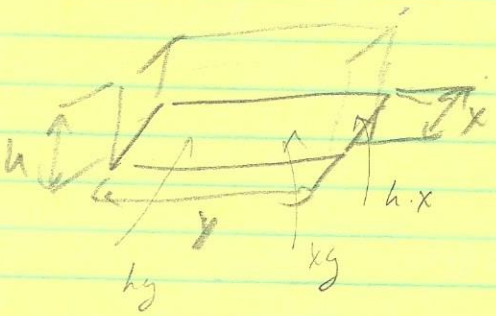
Ex Sand box can hold 256 cm^3 of sand.

Find dims for which surf area = min. (bottom + 4 sides)



$$h = \frac{256}{xy}$$

$$\Rightarrow 2x\left(\frac{256}{xy}\right) + 2y\left(\frac{256}{xy}\right) + xy =$$

$$= \frac{512}{y} + \frac{512}{x} + xy$$

Boundary $x=0 \quad \infty$

$y=0 \quad \infty$

$$f_x = -\frac{512}{x^2} + y = -\frac{512}{y^2} + x = f_y \Rightarrow x = \sqrt[3]{512} = 8.$$

$y = 8$

$h = 4$

L Constrained extremum

Thm L. mult $f: U \subset \mathbb{R}^n \to \mathbb{R}$ $g: U \subset \mathbb{R}^n \to \mathbb{R}$ $\in C^1$

Max. on the level set $g(x) = c$.

If x_0 is such an extr. & $\nabla g(x_0) \neq 0 \Rightarrow$

$$\nabla f(x_0) = \lambda \nabla g(x_0)$$

L. m.