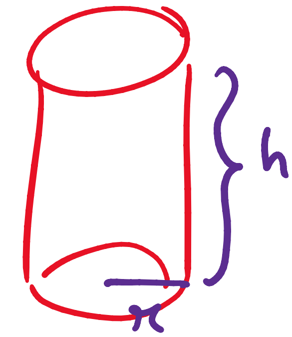
CPS-5310

Tuesday, March 10, 2020 1:36 PM

S: cylinder of volume 1.
$r \to$ radius & h = height of cylinder



Q: What are the dimensions r & h that minimize the total surface area ?

M: minimize $\boxed{2 * \pi r^2 + 2\pi r h}$

such that volume $= 1$

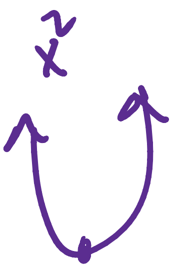
$\pi r^2 h = 1$

Objective function

min $A(r,h) = 2\pi r^2 + 2\pi r h$

s.t $\pi r^2 h = 1$

$$A(r) = 2\pi r^2 + 2\pi r\left(\frac{1}{\pi r^2}\right)$$



$$A(r) = 2\pi r^2 + 2/r$$

$$A'(r) = 4\pi r - 2/r^2 \to A'(r) = 0$$

and find r^* : $A'(r^*) = 0$ & $A''(r^*) > 0$

Models: mixing problem or LPP or Calculus problem.

Models expressed using Differential Equations.

Models expressed using differential equ

focus: some closed form solutions
(solving ODE)** ** integration & Partial fractions decomp
Numerical method to solve ODEs.

$$\int \frac{dx}{x^2+bx+c} = \int \frac{A\,dx}{(x-\alpha_1)} + \int \frac{B\,dx}{(x-\alpha_2)}$$

Simulations → PRAGMATIC PROGRAMMER

ODE solver → Matlab, Maxima.