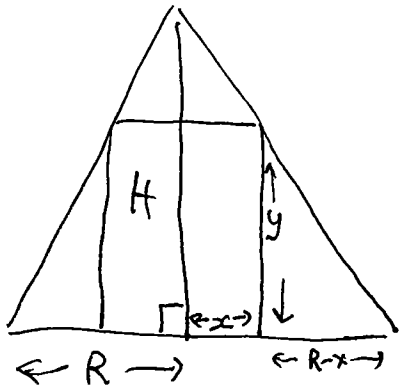
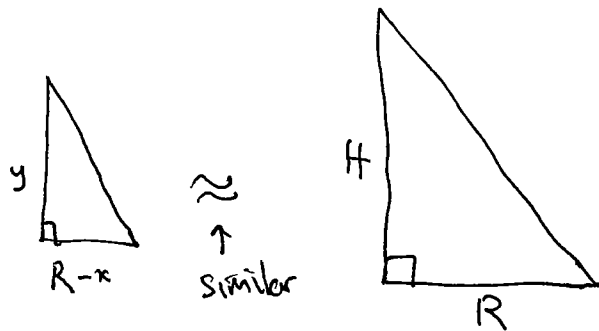


Q1].. A right circular cylinder is inscribed in a cone of height h and base radius r . Find the largest possible volume of such a cylinder. Show the steps of your work.



Let $x =$ radius of cylinder
 $y =$ height of cylinder



$$\text{Similar } \Delta^s \Rightarrow \frac{y}{H} = \frac{R-x}{R}$$

$$\Rightarrow y = \frac{H}{R}(R-x)$$

$$\begin{aligned} \text{Want to maximize cylinder volume} &= (\pi x^2) y \\ &= \pi x^2 \frac{H}{R}(R-x) \end{aligned}$$

$$V(x) = \frac{\pi H}{R}(Rx^2 - x^3)$$

$$V'(x) = \frac{\pi H}{R}(2Rx - 3x^2)$$

$$V'(x) = 0 \quad \text{gives } (2R - 3x)x = 0$$

$$\Rightarrow x = 0 \quad \text{or}$$

$$x = \frac{2R}{3}$$

$$y = \frac{H}{R}\left(R - \frac{2R}{3}\right) = \frac{H}{3}$$

$$y = \frac{H}{3}$$

end at
 $\text{Vol} = 0$

Dimensions \uparrow largest vol cylinder.

$$\text{Vol}_{\max} = \left(\frac{4}{9}R^2\pi\right)\left(\frac{H}{3}\right) = \frac{4}{27}\left(\frac{1}{3}\pi R^2 H\right)$$