

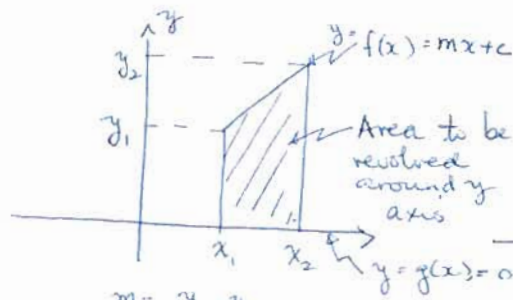
Set 7 prep

$$V = 2\pi \int_{x_1}^{x_2} x [f(x) - g(x)] dx$$

$$V = 2\pi \int_{x_1}^{x_2} x \left[\frac{y_2 - y_1}{x_2 - x_1} x + \frac{x_2 y_1 - x_1 y_2}{x_2 - x_1} \right] dx$$

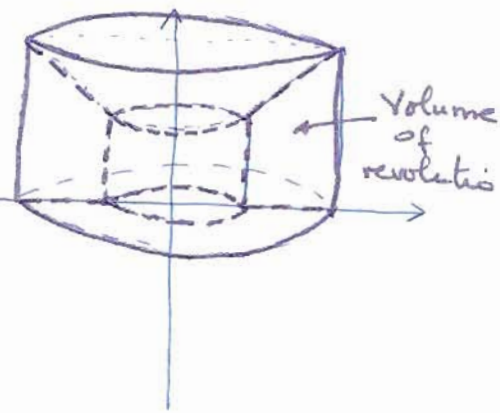
$$V = 2\pi \int_{x_1}^{x_2} \left[\frac{1}{3} \frac{y_2 - y_1}{x_2 - x_1} x^3 + \frac{1}{2} \frac{x_2 y_1 - x_1 y_2}{x_2 - x_1} x^2 \right] dx$$

$$V = \frac{2\pi}{3} \left[2 \frac{y_2 - y_1}{x_2 - x_1} (x_2^3 - x_1^3) + 3 \frac{x_2 y_1 - x_1 y_2}{x_2 - x_1} (x_2^2 - x_1^2) \right]$$



$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$c = \frac{x_2 y_1 - x_1 y_2}{x_2 - x_1}$$

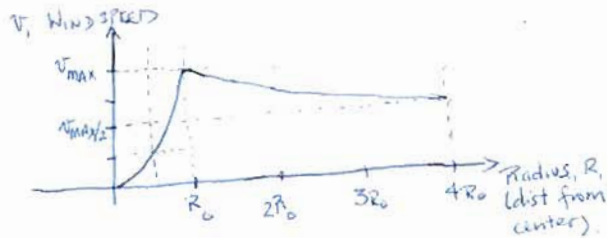


So the volume of revolution due to a trapezoid bounded by the points $(x_1, 0)$, (x_1, y_1) , (x_2, y_2) & $(x_2, 0)$

$$V_{\text{TRAP}} = \frac{\pi}{3} \left[2 \frac{y_2 - y_1}{x_2 - x_1} (x_2^3 - x_1^3) + 3 \frac{x_2 y_1 - x_1 y_2}{x_2 - x_1} (x_2^2 - x_1^2) \right]$$

Check Let $x_1 = y_1 = 0$; $x_2 = r$; $y_2 = h$. $V_{\text{cone}} = \frac{1}{3} \pi r^2 h$ so $V_0 = \pi r^2 h [1 - \frac{1}{3}] = \frac{2}{3} \pi r^2 h$

From the formula for V_{TRAP} above, $V_0 = \frac{\pi}{3} \left[2 \cdot \frac{h}{r} \cdot r^3 + 0 \right] = \frac{2}{3} \pi r^2 h \checkmark$



$$v = \begin{cases} v_{\text{max}} \left(\frac{R}{R_0} \right)^2, & R \leq R_0 \\ v_{\text{max}} \sqrt{\frac{R_0}{R}}, & R > R_0 \end{cases}$$

Let D be the rate of energy dissipation per unit area.

$$D = \rho_{\text{AIR}} \gamma v^3$$

ρ_{AIR} - density of air
 γ - drag coefficient
 ← CONSTANTS

Since v is a function of R , $D = f(R)$ so, composing the volume of revolution equation to this case, we would get --

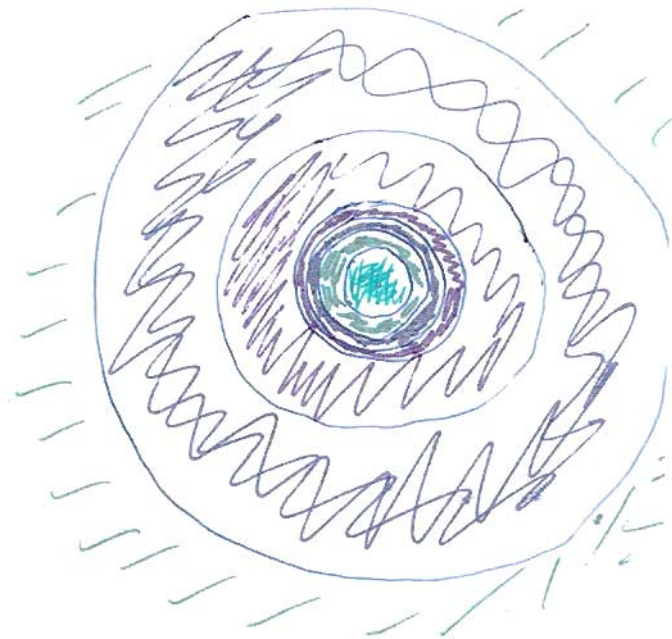
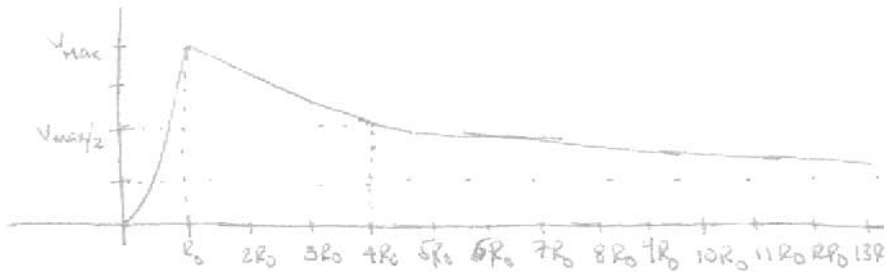
$$E = \frac{\pi}{3} \left[2 \frac{D_2 - D_1}{R_2 - R_1} (R_2^3 - R_1^3) + 3 \frac{R_2 D_1 - R_1 D_2}{R_2 - R_1} (R_2^2 - R_1^2) \right]$$

where E_{RING} is the energy dissipated in an annular ring with inner radius R_1 and outer radius R_2

So $E_{\text{STORM}} = \sum_{\text{all rings}} E_{\text{RING}}$

GVI

- (1) Draw graph of wind speed vs distance for up to $16 R_0$
- (2) Create legend & plot of hurricane wind speed
- (3) Create legend & plot of hurricane energy.



[Similar display for storm energy]