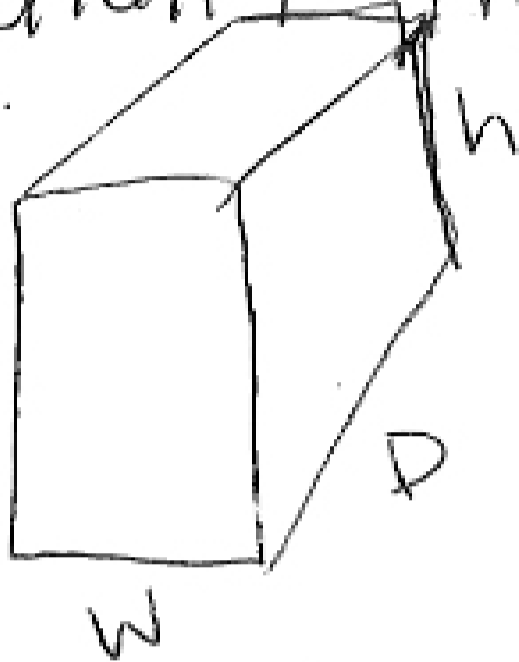
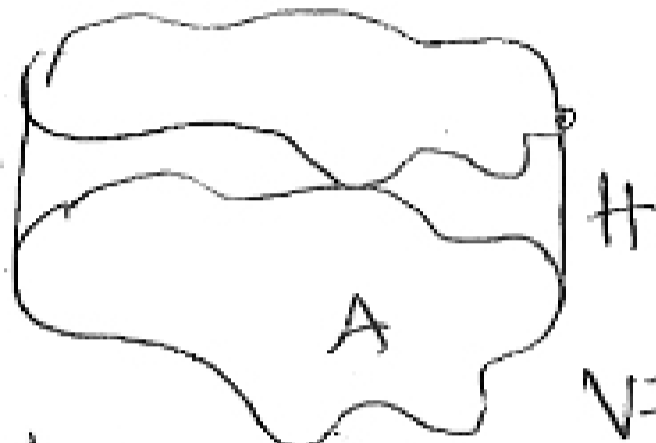


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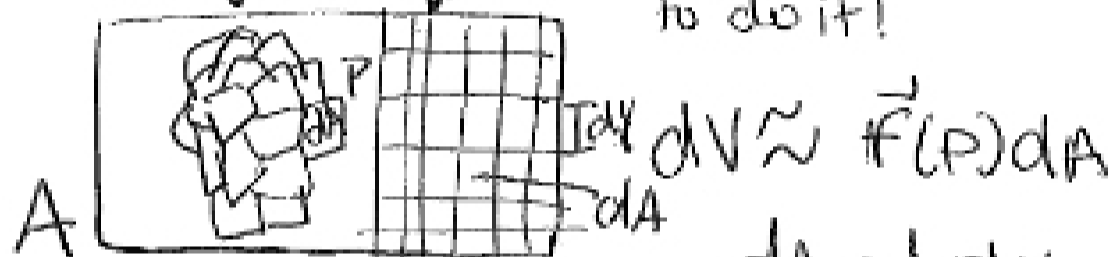
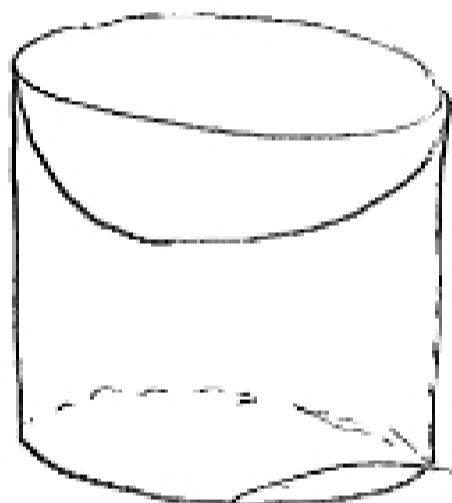


$$V = WDH$$



$$V = A \cdot H$$

reasonable boundaries and equations
 example → how we are actually going to do it!



double integral (multiple)

roof $z = f(x, y)$
 floor $z = 0$

$$V = \iint_A dV = \iint_A f(x, y) dA$$

ex: roof $z = xy + 3$

$$V = \iint_A (xy + 3) dA$$

$$1 \leq x \leq 7$$

$$2 \leq y \leq 5$$

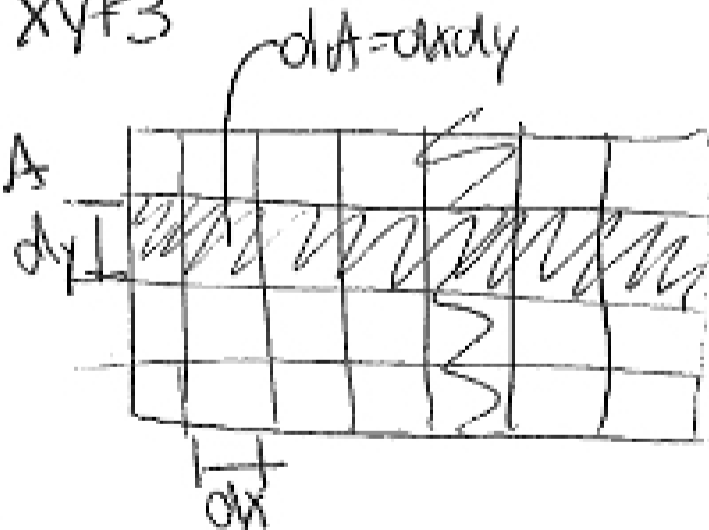
$$\int_2^5 \left[\int_1^7 (xy + 3) dx \right] dy$$

iterated integral

$$= \int_2^5 \left(\frac{19}{2}y + 21 \right) - \left(\frac{7}{2} + 3 \right) dy$$

*horizontally first

$$V = \int_2^5 \left[\frac{xy^2}{2} + 3xy \right]_{x=1}^{x=7} dy$$



* answer should end up being a constant - no x or y at the end!

example continued:

$$= \int_2^5 \left(\frac{49}{2}y + 21 \right) - \left(\frac{y}{2} + 3 \right) dy$$

$$= \int_2^5 24y + 18 dy = \left[12y^2 + 18y \right]_{y=2}^5 = (300 + 90) - (48 + 36)$$

* vertically first

$$V = \int_1^2 \left[\int_2^5 (xy + 3) dy \right] dx$$

$$= 306$$

* You can only switch from horizontally to vertically for a rectangle!