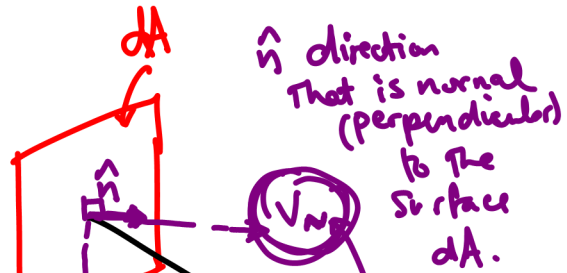
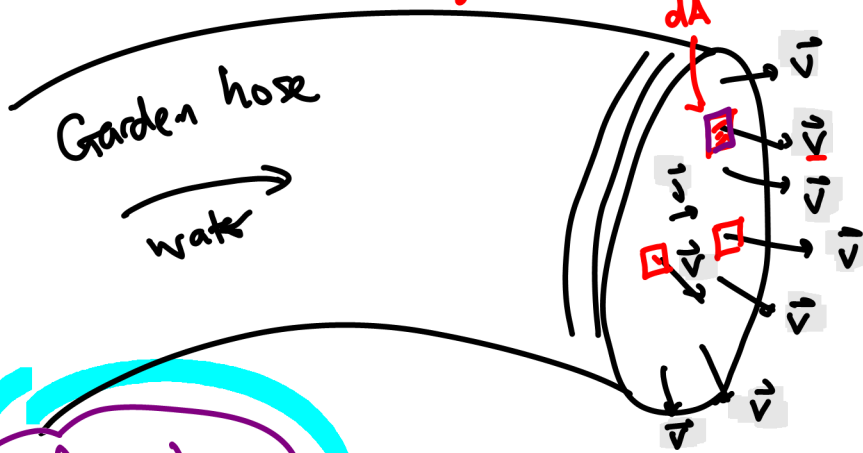


What is the volume flow rate?
(velocity flux)

at the surface of garden hose



flow in this direction does not leave the surface

$$\vec{v} \cdot \hat{n}$$

for the entire hose:

$$\Phi = \int (\vec{v} \cdot \hat{n}) dA$$

Integrate over the entire surface.

velocity flux
i.e. volume flow rate

$$\Phi = \int (\vec{v} \cdot \hat{n}) dA$$

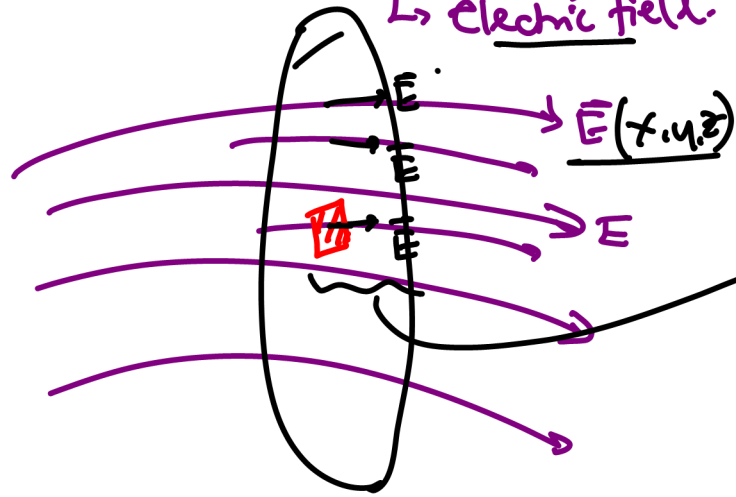
$$\Phi = \int \vec{v} \cdot d\vec{A}$$

vector $d\vec{A}$
- magnitude dA
- direction is normal to the surface.

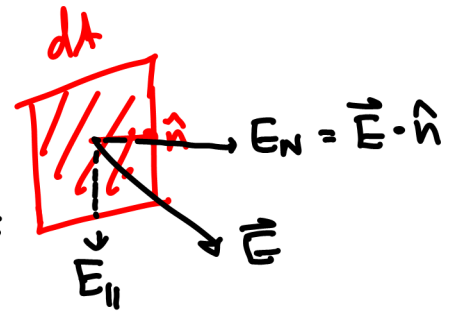
\vec{v} is just a vector

↳ you can calculate the flux of any vector through a surface.

- ↳ mass?
- ↳ momentum?
- ↳ bananas??
- ↳ electric field.



flux



$$d\Phi = (\vec{E} \cdot \hat{n}) dA$$

$$\Phi = \int (\vec{E} \cdot \hat{n}) dA = \int \vec{E} \cdot d\vec{A}$$