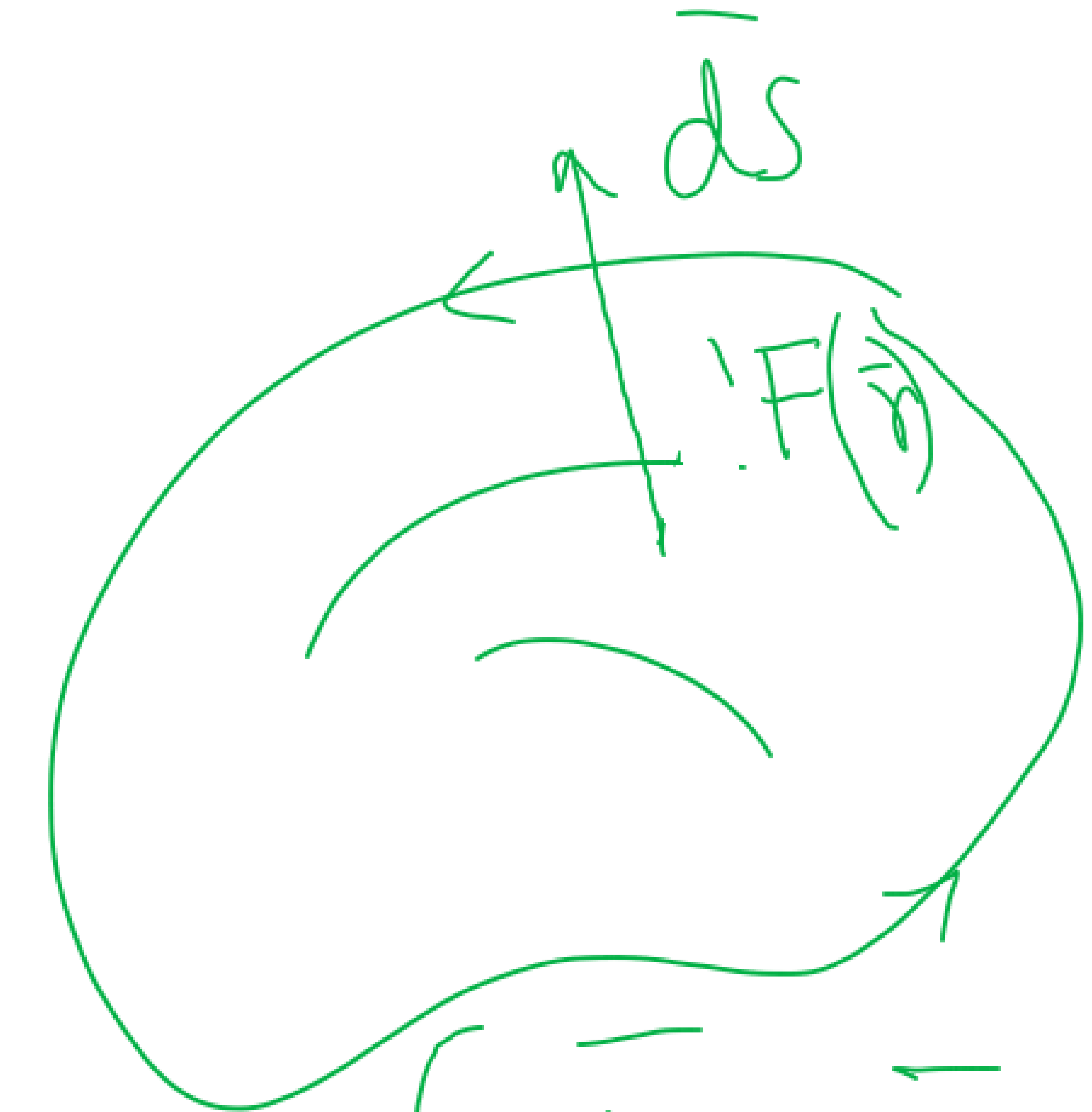
$$\bar{r} - \bar{P} = \bar{a}$$

$$\bar{\nabla} V \cdot d\bar{r}$$

$$= \frac{\partial V}{\partial x} dx + \frac{\partial V}{\partial y} dy + \frac{\partial V}{\partial z} dz$$

$$= dV$$



Stokes Th

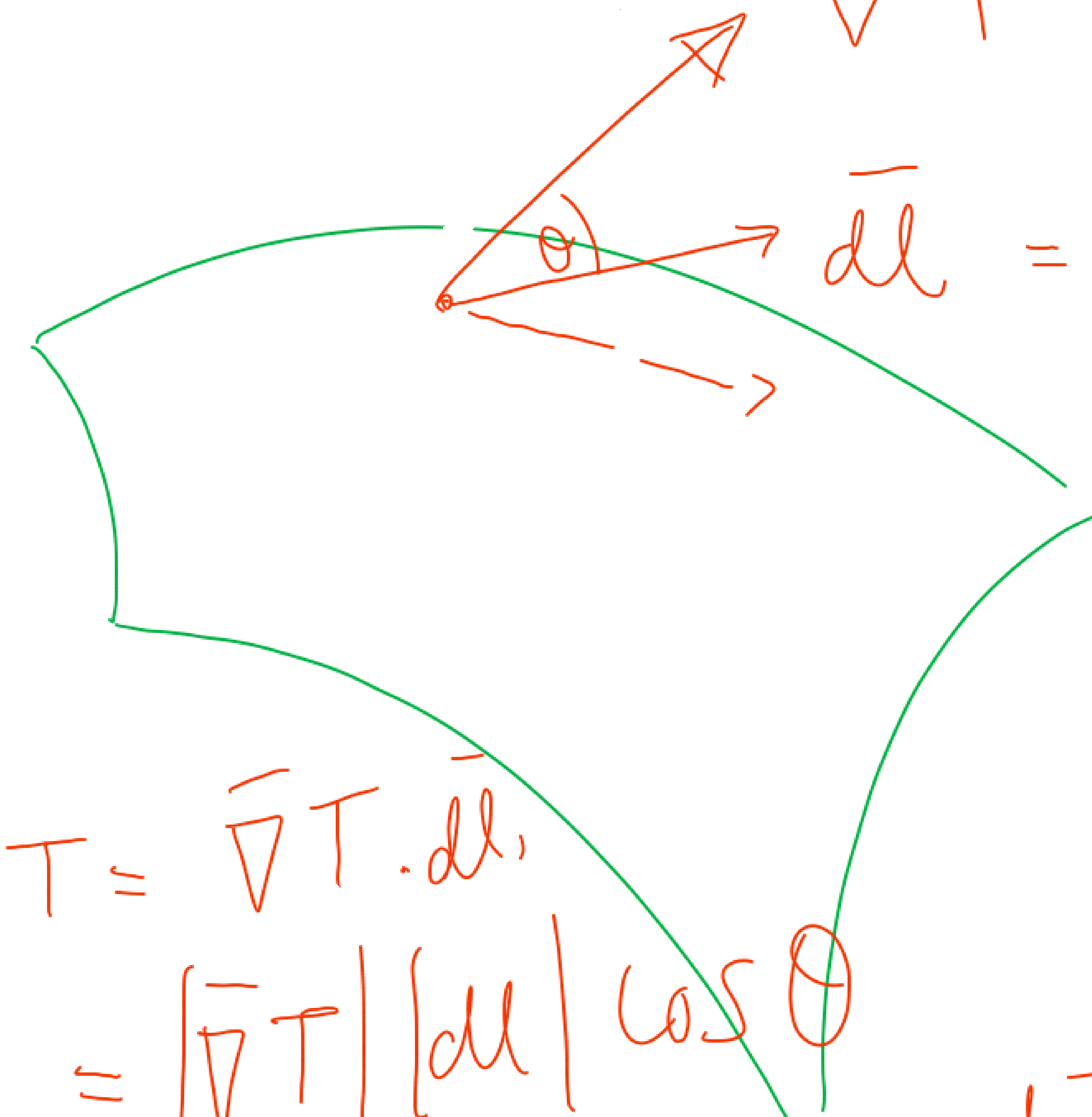
$$\oint \bar{F} \cdot d\bar{l}$$

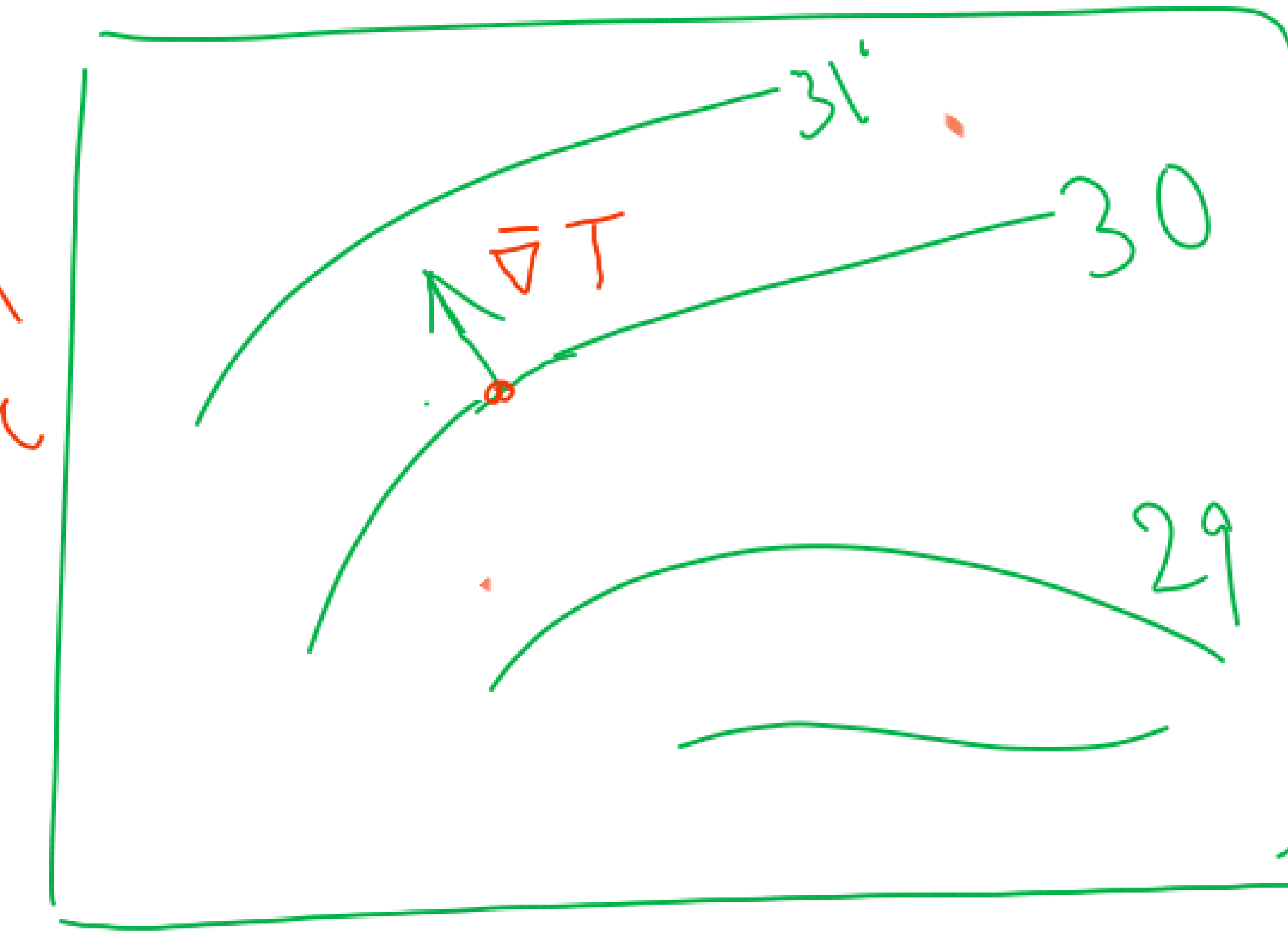
$$= \iint \bar{\nabla} \times \vec{F} \cdot d\bar{s}$$

$$\oint \bar{F} \cdot d\bar{l} = \simeq \longrightarrow \int \underbrace{\bar{\nabla} \times \bar{F}}_{= 0} \cdot d\bar{s}$$

$\bar{\nabla} T$

$$\bar{dl} = dx\,\hat{i} + dy\,\hat{j} + dz\,\hat{k}$$





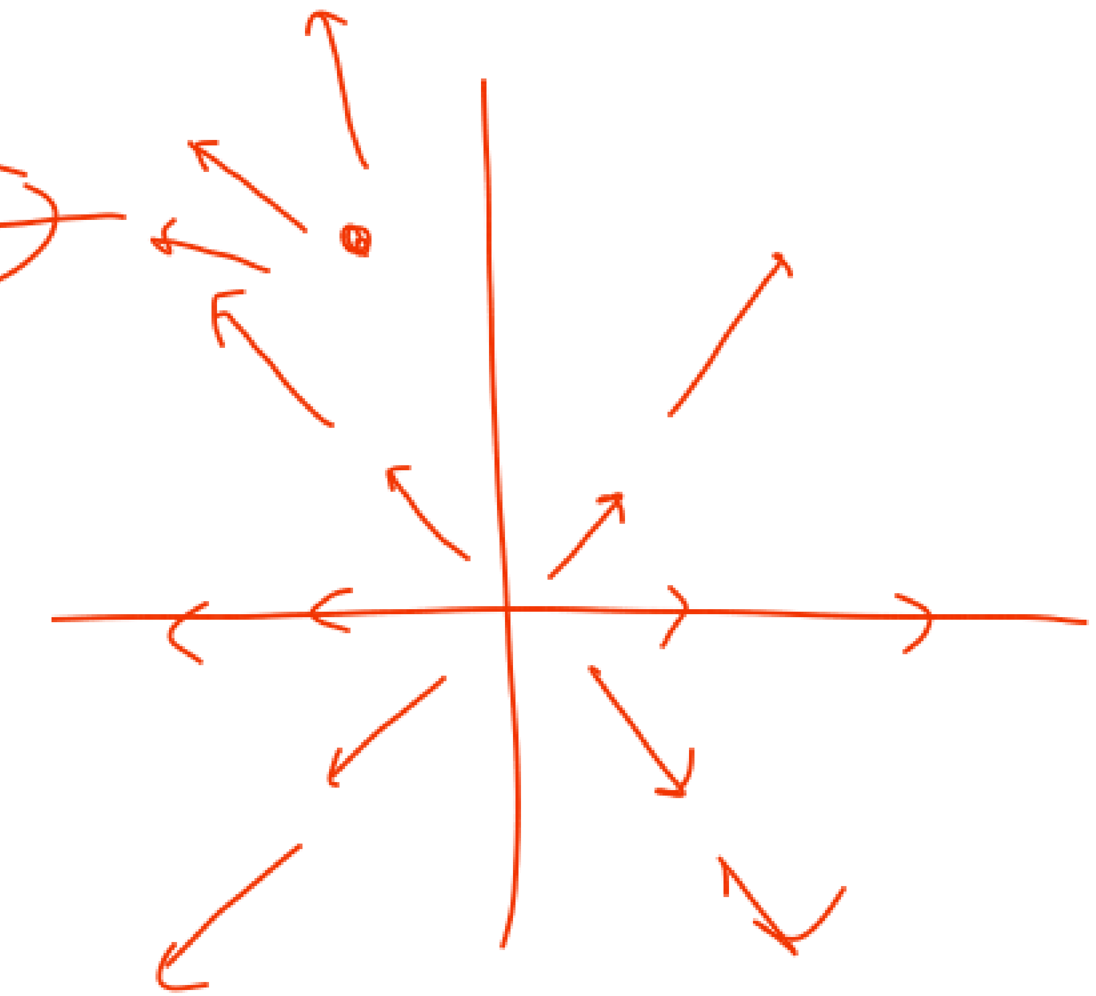
$$\bar{\nabla} \quad T(x, y, z)$$

$$dT = \bar{\nabla} T \cdot \bar{dl},$$

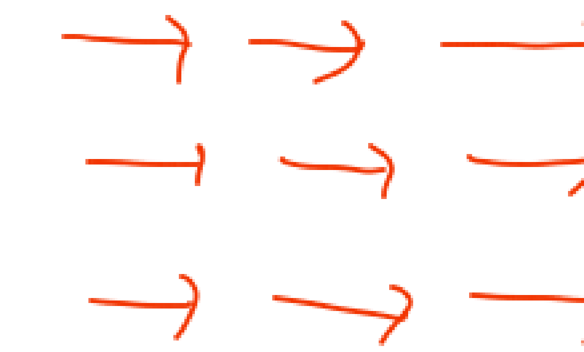
$$= |\bar{\nabla} T|\,|\bar{dl}| \cos\theta$$

$\bar{dl}$ along the surfe $\quad dT = 0 \Rightarrow \bar{\nabla} T$ & $\bar{dl}$ must be $\perp$

$$\bar{\nabla}\cdot\bar{A}(\bar{r}) =$$



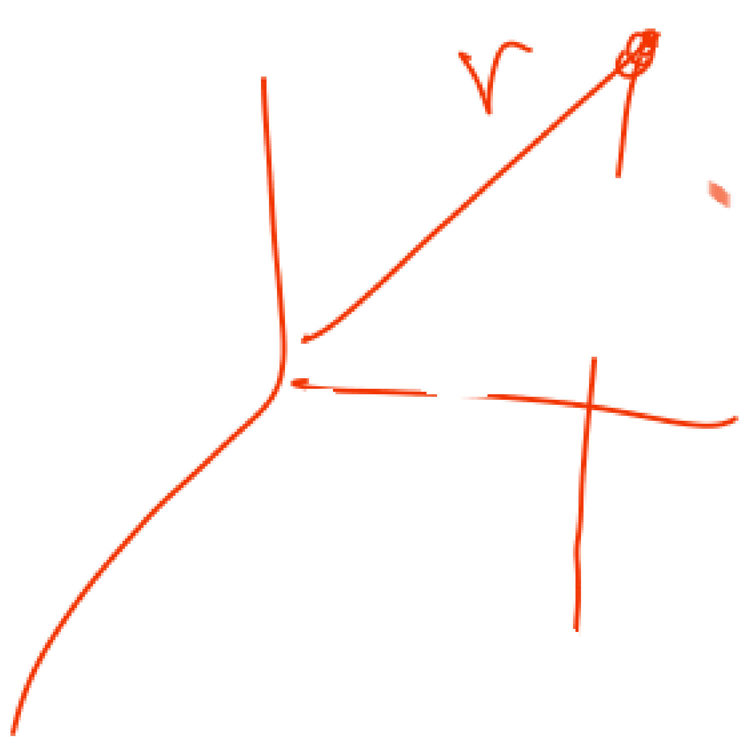
$$\bar{A}(\bar{r}) = c\,\hat{i}$$



$$\bar{A}(\bar{r}) = c\,\hat{r}$$

$$\bar{r} = r\hat{r} + z\hat{z}$$

$$= c\frac{\left(x\hat{i} + y\hat{j}\right)}{\sqrt{x^2+y^2}} \Rightarrow \bar{\nabla}\cdot\bar{A} = \frac{c}{r} = \frac{c}{\sqrt{x^2+y^2}}$$



$$\bar{A} = A_r\hat{r} + A_\theta\hat{\theta} + A_z\hat{z}$$

$$\bar{\nabla}\cdot\bar{A} = \frac{1}{r}\frac{\partial}{\partial r}\left(rA_r\right) = \frac{c}{r}$$

3D spherical polar $\bar{\nabla}\cdot\bar{A} = \frac{2c}{r}$

Consider 3D $\bar{A}(\bar{r}) = c\,\bar{r} = c\sqrt{r^2+z^2} = c(r\hat{r} + z\hat{z}) = c\,r\hat{r}$

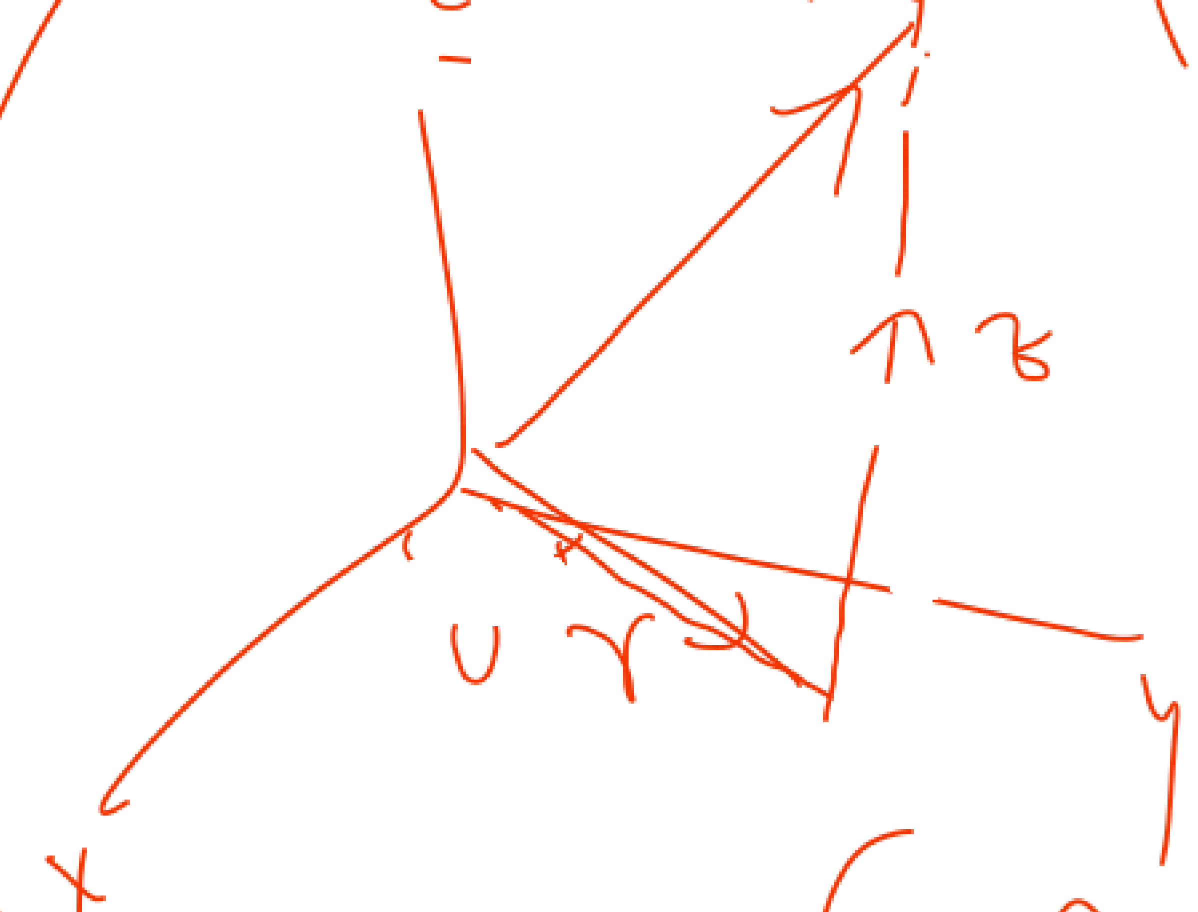
cylindrical polar (r, θ, z) $\quad \bar{\nabla}\cdot\bar{A}$

spherical polar (r, θ, φ)

$$\frac{1}{r}\frac{\partial}{\partial r}(rcr) + \frac{\partial cz}{\partial z}$$

$$2c + c$$

$\bar{r} = (r, \theta, z)$



$\bar{r} = r\hat{r}$

$c(x\hat{i} + y\hat{j} + z\hat{k})$

$\bar{\nabla}\cdot\bar{A} = 3c$