90% ≡ full credit ⟶ 100% at end of semester.

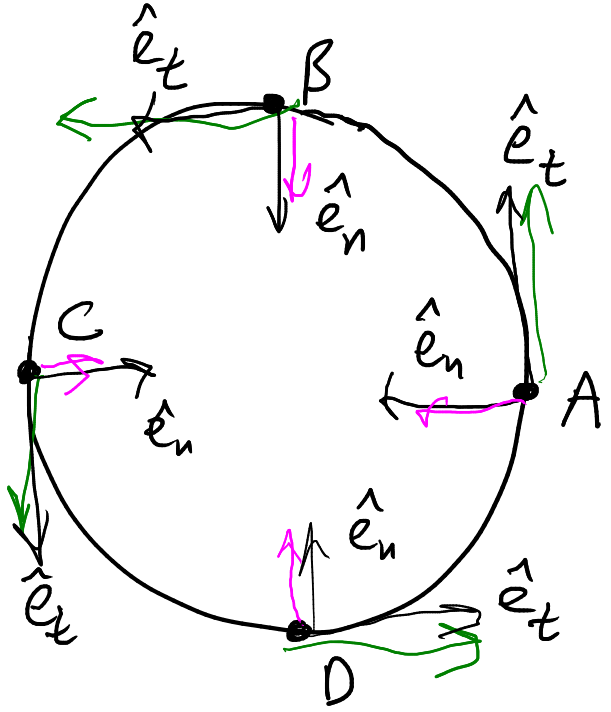
↖ M/W/F

100% = bonus credit ⟶ 110% - - . -

↖ M/W

Tangential / Normal basis vectors

ex 1 uniform circular motion



Constant speed

$\dot{s} = \text{const}$

$\|\vec{v}\|$ constant

$\vec{v}$ tangential

$$\hat{e}_t = \hat{v} = \frac{\vec{v}}{\|\vec{v}\|} = \frac{\vec{v}}{v}$$

$$\hat{e}_n = \frac{\dot{\hat{e}}_t}{\|\dot{\hat{e}}_t\|}$$

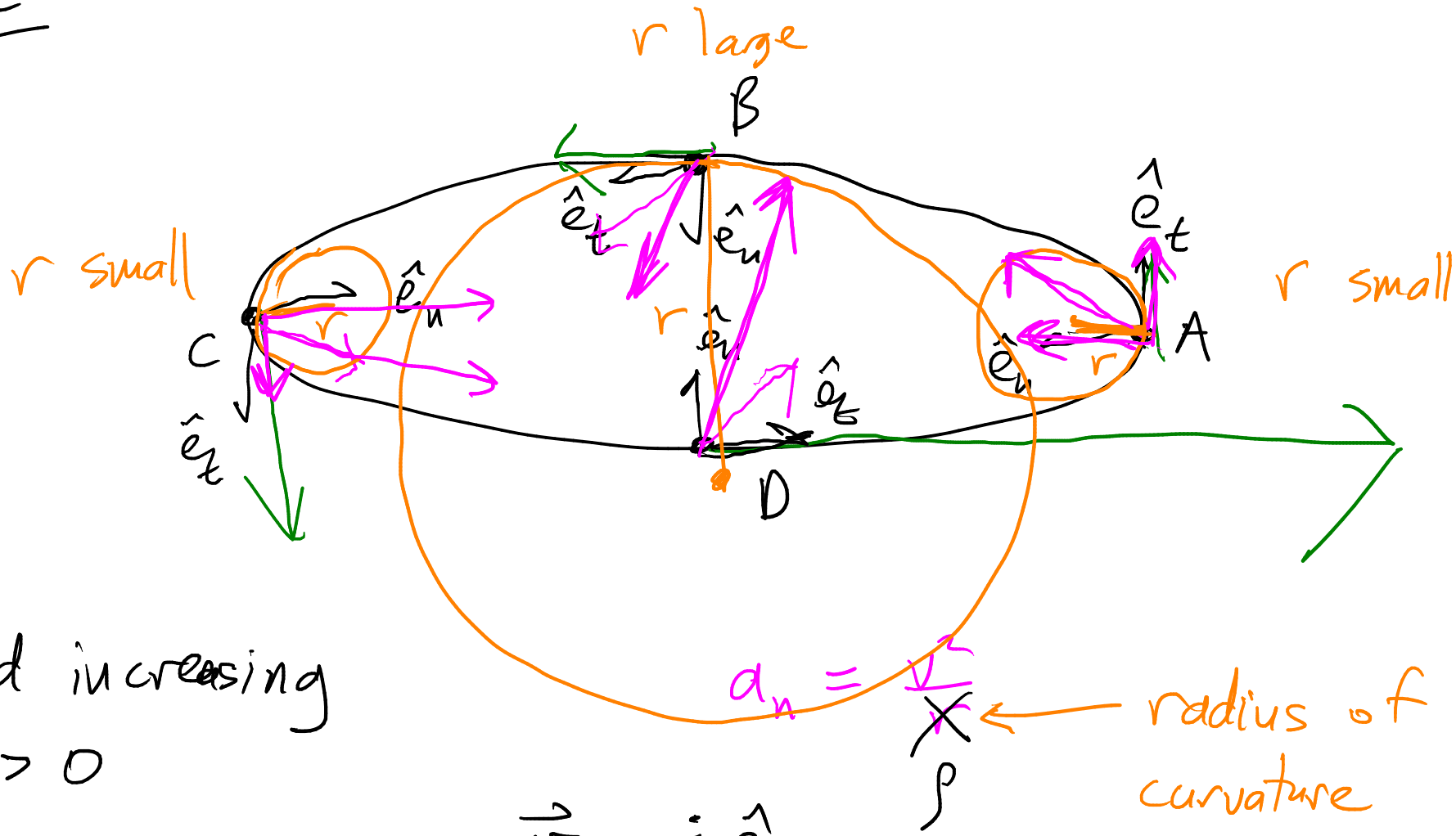
A: correct

B: wrong

$$\|\vec{a}\| = \frac{v^2}{r} = r\omega^2 = \text{Constant}$$

$\vec{a}$ = normal

ex 2



speed increasing

$\begin{cases} \dot{v} > 0 \\ \ddot{s} > 0 \end{cases}$

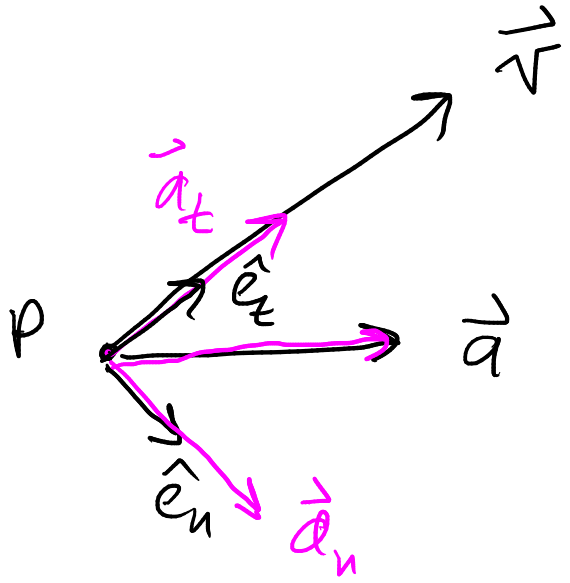
$\ddot{s}$ ↑ constant

$\vec{v} = \dot{s}\,\hat{e}_t$

$\vec{a} = \ddot{s}\,\hat{e}_t + \frac{\dot{s}^2}{\rho}\,\hat{e}_n$

$\ddot{s}$ ↑ a_t ; $\frac{\dot{s}^2}{\rho}$ ↑ a_n

$\frac{1}{\rho} = k$ ↑ curvature



speeding up

$\vec{a}_t = \text{Proj}(\vec{a}, \vec{v})$

$\vec{a}_n = \text{Comp}(\vec{a}, \vec{v})$

$\hat{e}_n = \dfrac{\vec{a}_n}{\|\vec{a}_n\|}$

$\vec{a} = \vec{a}_t + \vec{a}_n$

$= \ddot{s}\,\hat{e}_t + \dfrac{\dot{s}^2}{\rho}\,\hat{e}_n$