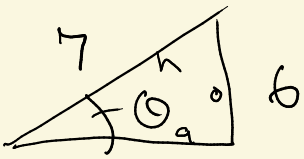
Thursday: Project 3

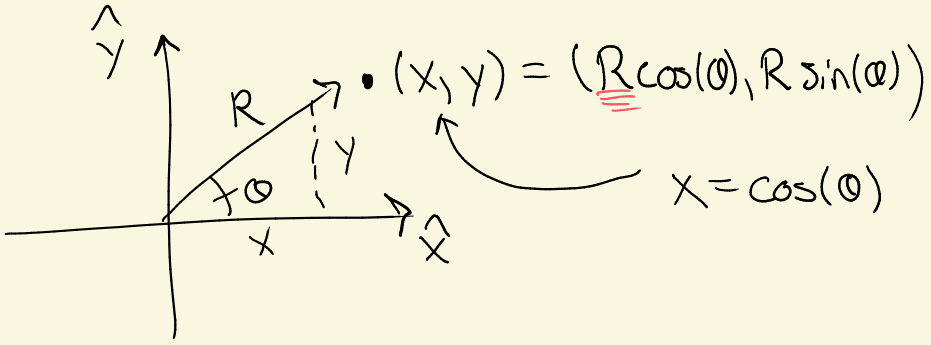
- Notes on quiz
  - Processes vs solutions
  - Exact ratios when possible

$\sin(\theta) = ? = \frac{6}{7}$



$\sin(\theta) \approx 0.86$

- Polar coords:



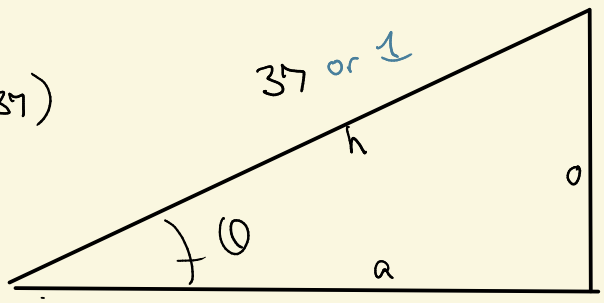
only if R=1

- Why do any of this? Calculus!

Solving an "integral" ⟶ Ex $\cos(\overbrace{\arcsin(5/37)}^{\theta}) = ?$

↳ $\cos(\theta) = ?$

$\theta = \arcsin(5/37)$



5 or $5/37$

$\sqrt{37^2 - 5^2}$ or ?

$= \frac{\sqrt{37^2 - 5^2}}{37}$

$5^2 + a^2 = 37^2$

$\Rightarrow \sin(\theta) = \sin(\arcsin(5/37))$

$\Rightarrow \sin(\theta) = 5/37$ ← on a restricted domain

$= o/h$

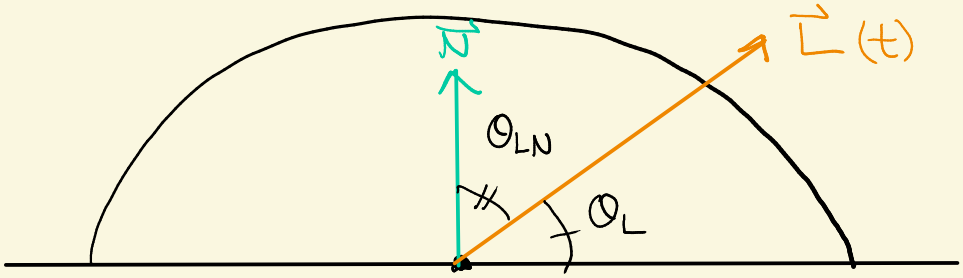
- Last note: watch the video! (graded)

Project Details

Reminder (Office hours)

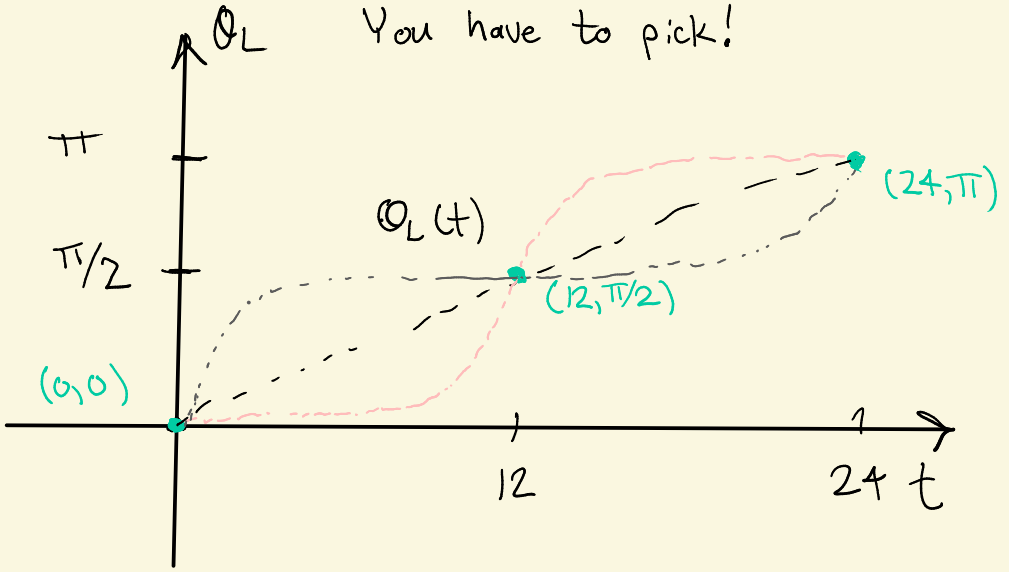
⚠ Refer to class notes, video, handout closely!

Model:

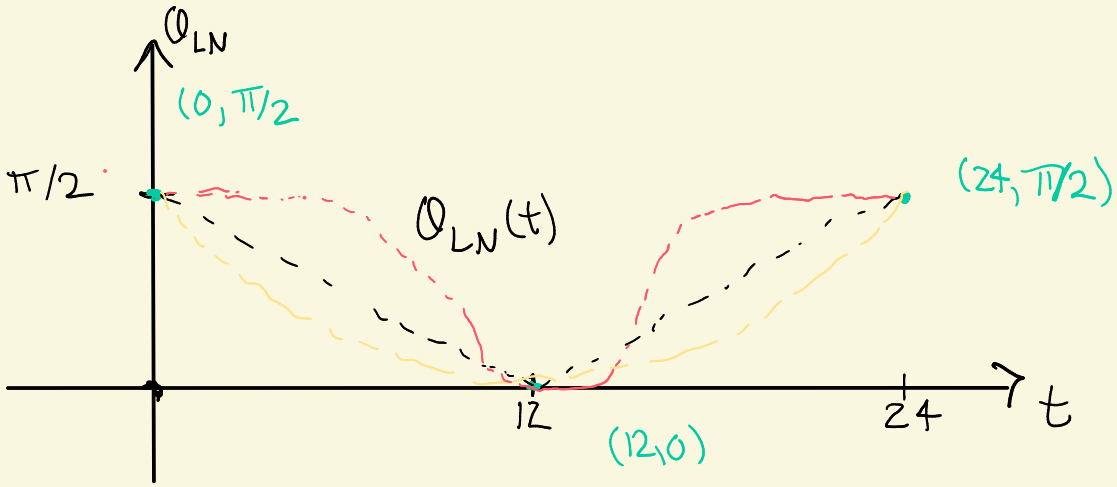


Want (for rough draft)

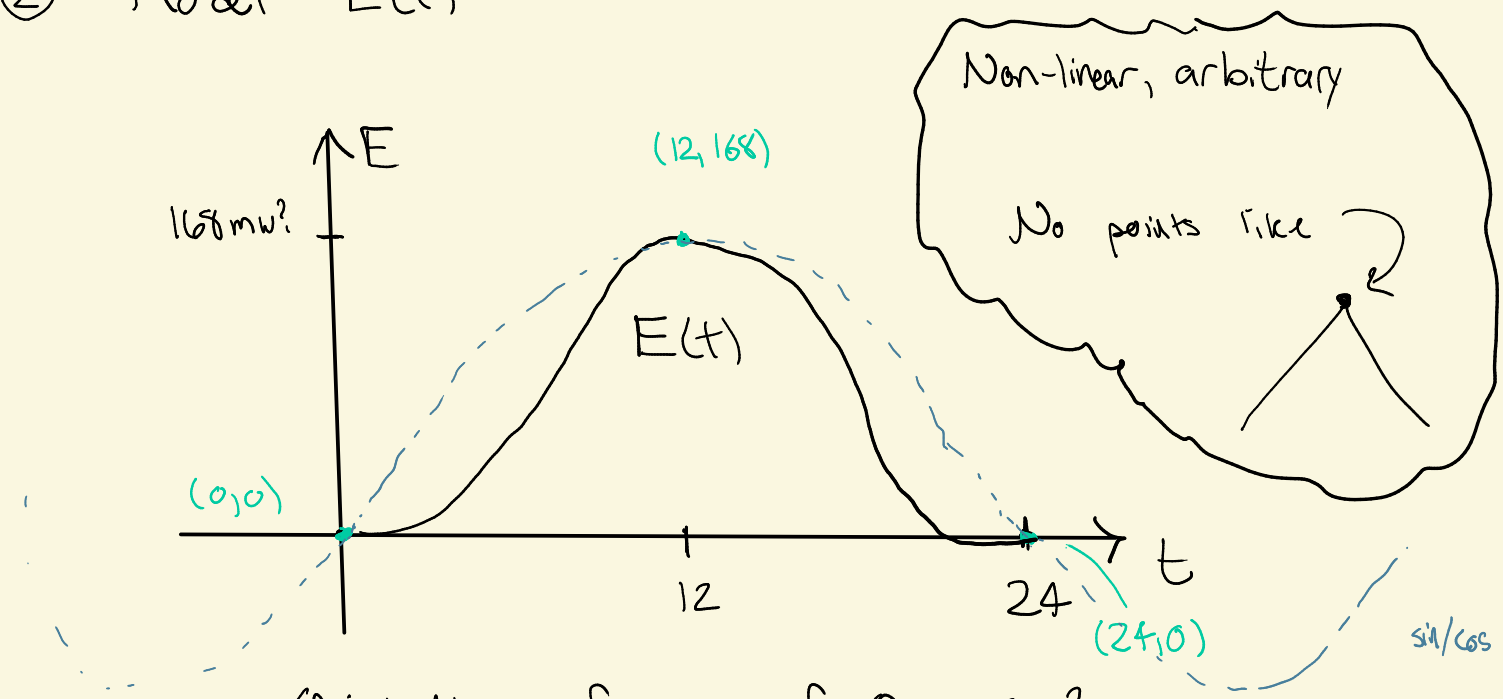
(1) • $\theta_L(t)$



• $\theta_{LN}(t)$



② Model $E(t)$



Q: is this a function of θ_L or θ_{LN}?

$$E(t) = f(\theta_{LN}(t))\ ?$$

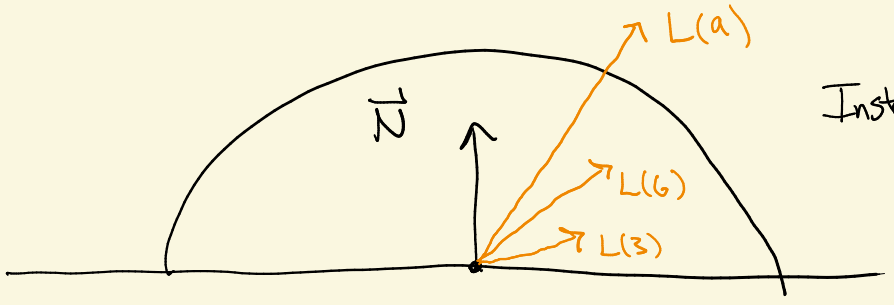
Need to include (for $\theta_L(t)$, $\theta_{LN}(t)$, $E(t)$)

- Formulas
- Graphs (labels important!)
- → Domains and ranges (eg $\text{domain}(\theta_L(t)) = [0, 24]$)
- Explain the periodicity (how to extend domain to $\mathbb{R}$)

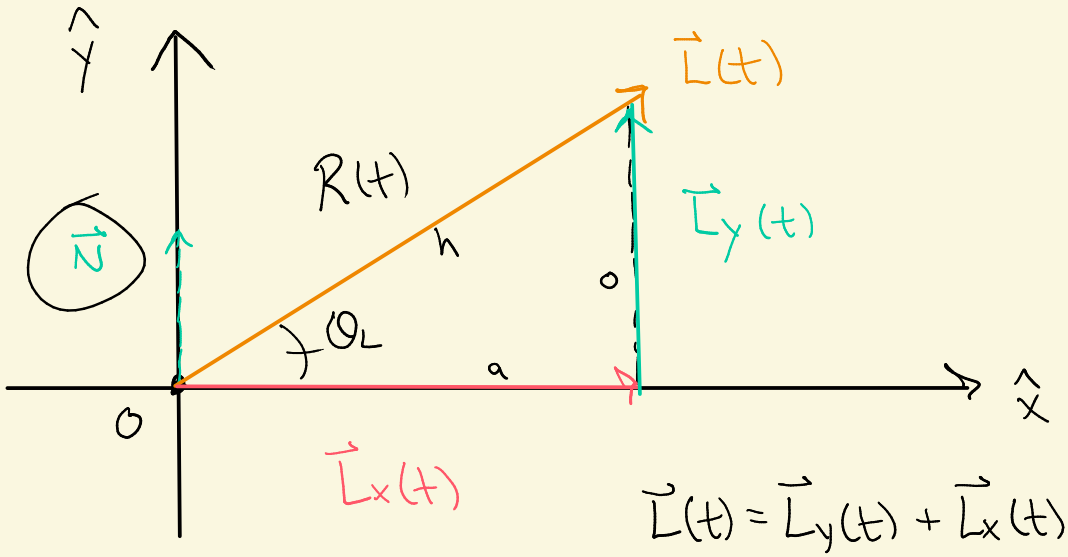
③ Deriving the vector components

New; don't assume $\|\vec{L}(t)\| = 1$

Instead $\|\vec{L}(t)\| = E(t)$



Choose a coord system along $\vec{N}$



$$\vec{L}(t) = \vec{L}_y(t) + \vec{L}_x(t)$$

$$R(t) = \|\vec{L}(t)\| = E(t)$$

$$o = \|\vec{L}_y\|$$

$$h = \|\vec{L}\|$$

$$a = \|\vec{L}_x\|$$

Q: What is $\|\vec{L}_y(t)\|$?

$$\sin(\theta_L(t)) = \frac{o}{h}$$

$$= \frac{\|\vec{L}_y(t)\|}{R(t)} = \frac{\|\vec{L}_y(t)\|}{E(t)}$$

$$\Rightarrow \|\vec{L}_y(t)\| = E(t)\sin(\theta_L(t))$$

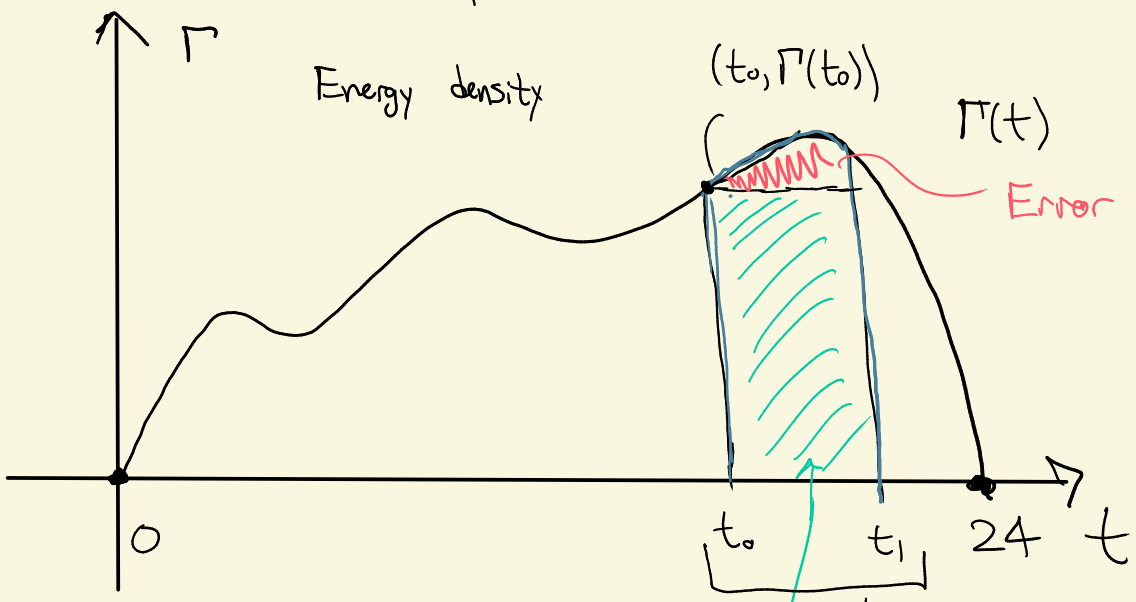
④ Total Energy Density

$$\Gamma(t) = \|\vec{L}_y(t)\| \cdot A$$

Area

$$= E(t)\sin(\theta_L(t)) \cdot A$$

Graph on $[0, 24]$



Total energy = Density · time interval in one

$[t_0, t_1]$ $\approx$ Area under the graph

$= \Gamma(t_0)\,\Delta t$

Total energy: break up $[0, 24]$ into $[0, t_1] \cup [t_1, t_2] \cup \cdots$

$[t_N, 24]$

$\Gamma(t_0)\Delta t + \Gamma(t_1)\Delta t + \cdots$

OH: 11-12

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