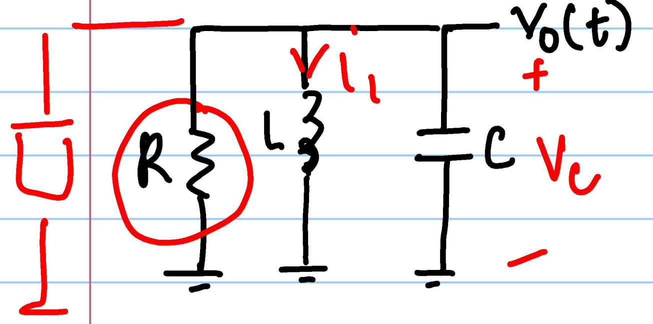
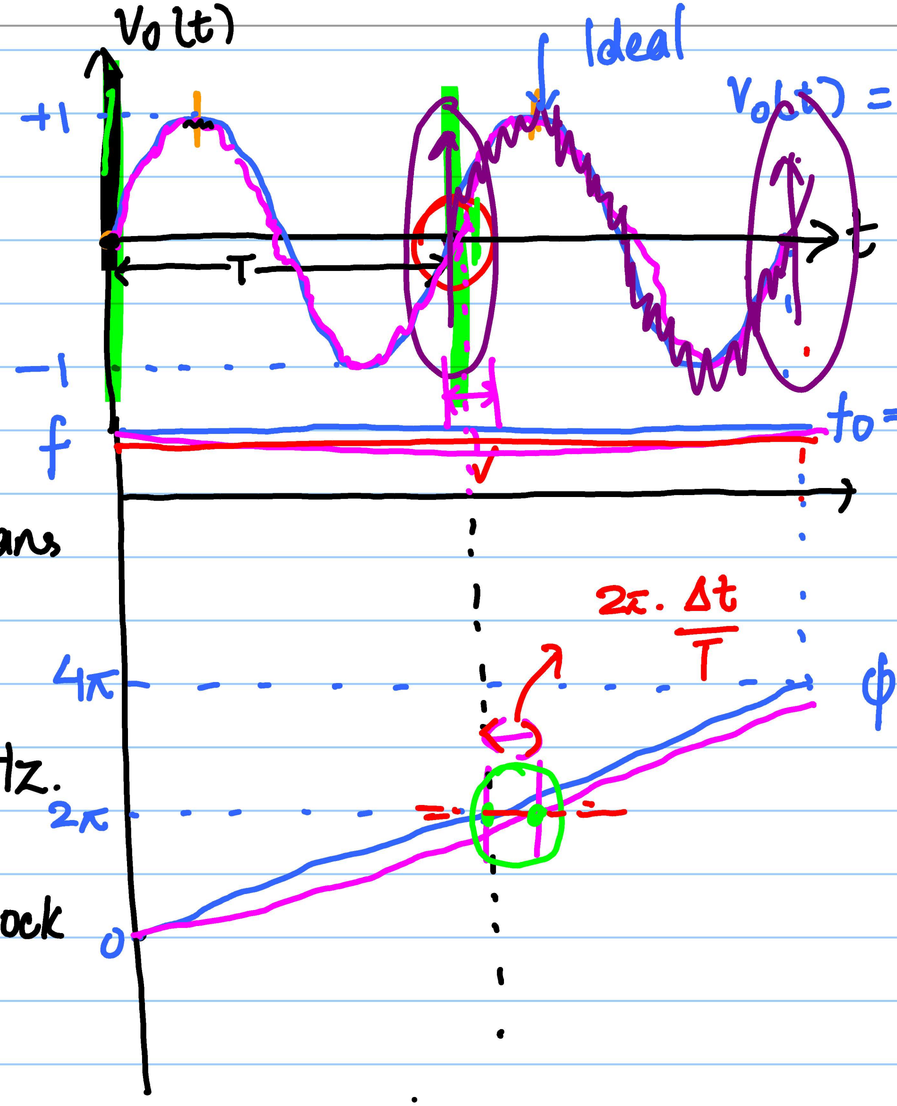
Lecture # 2

Note Title 10-09-2020





$v_0(t) = \sin(\underbrace{\omega_0 t})$

$\omega_0 = \frac{1}{\sqrt{LC}}$

$f_0 = \frac{1}{2\pi\sqrt{LC}}$ ✓

ω_0 : frequency in radians

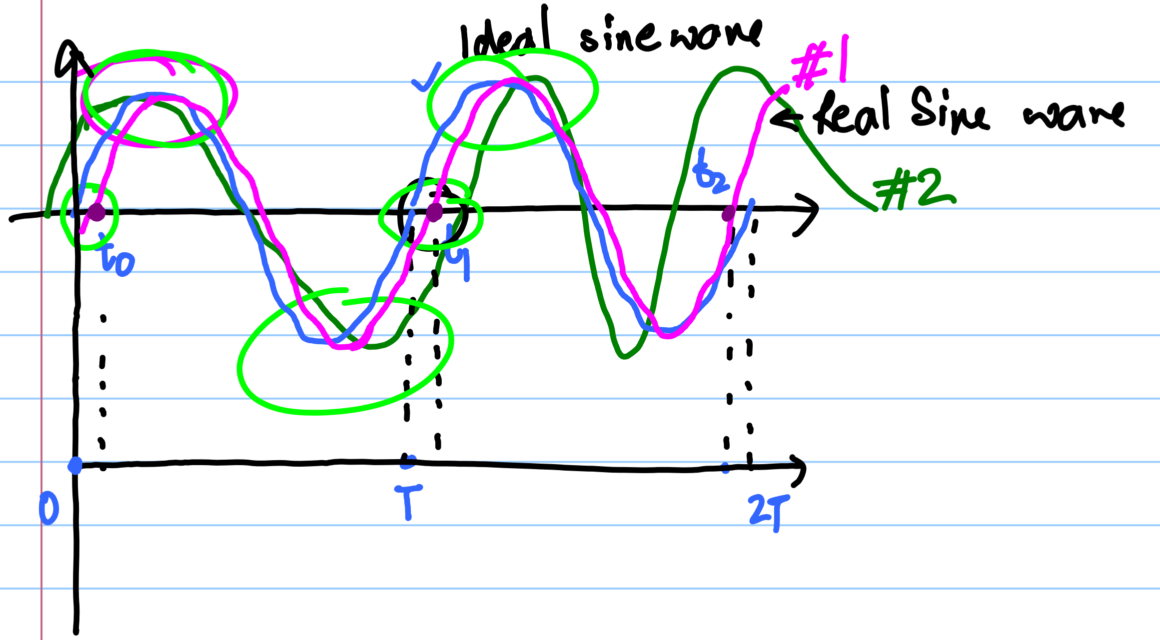
$\omega_0 = 2\pi f_0$

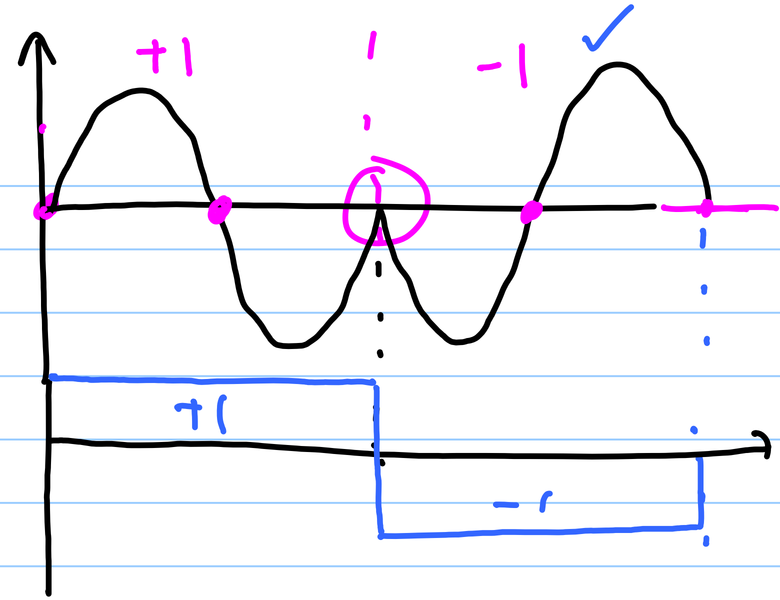
f_0 : frequency in Hertz.

$T = \frac{1}{f_0}$ Time period of clock

$\phi(t) = \int \omega \, dt$

$\phi(t) = \int_0^T \frac{2\pi}{T} \, dt = 2\pi$





$t_i - iT = \underset{\sim}{\Delta t_i}$

$\Delta t_0 = t_0 - 0 = t_0$

$\Delta t_1 = t_1 - T$

$\Delta t_2 = t_2 - 2T$

$\Delta t_0, \Delta t_1, \Delta t_2, \ldots$ random variables.

Mean :

Standard deviation: $\#1 < \#2$

max. / min

Ideal clock

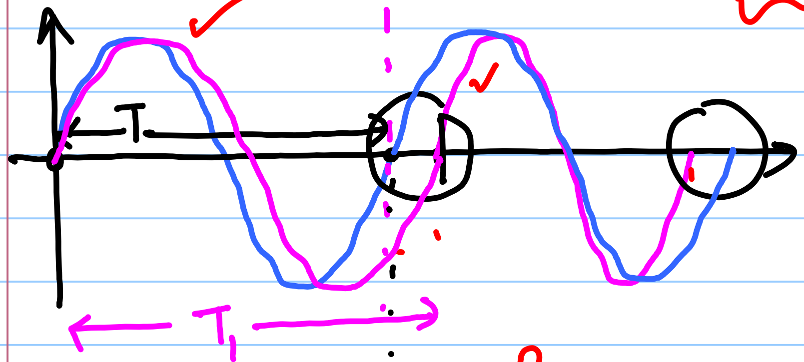
- $\sigma_{\Delta t} = 0$
- max. / min $(\Delta t) = 0$

$$\phi_{ideal}(t) = \int_0^t \omega_0 \, dt$$

$$\phi_{real}(t) = \int_0^t \omega \, dt$$

$$\phi_{er}(t) = \phi_{ideal}(t) - \phi_{real}(t)$$

$$= \sin\left(\int_0^t \omega\, dt\right)$$



$$\phi_{ideal}(t) = \int_0^T \frac{2\pi}{T} \cdot dt = 2\pi$$

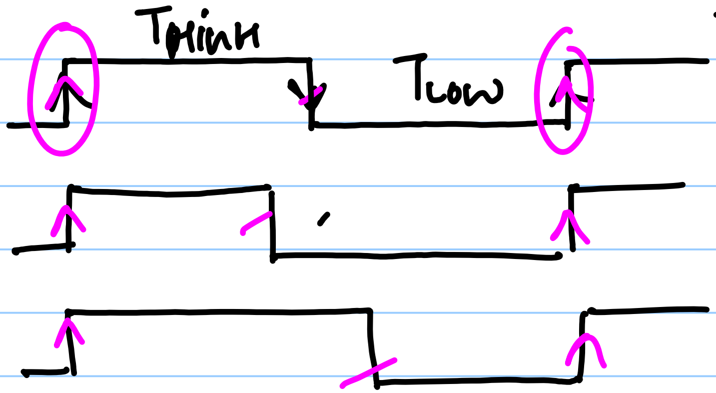
$$\phi_{real}(t) = \int_0^{T} \frac{2\pi}{T_1}\, dt = \frac{2\pi}{T_1} \cdot T$$

$$\frac{2\pi}{T_1} \qquad \frac{2\omega}{T_2}$$

$$\Delta t = t_1 - T = T_1 - T$$

$$\phi_{er} = \phi_{ideal}(t) - \phi_{real}(t)$$

$$= 2\pi\left(1 - \frac{T}{T_1}\right) = \frac{2\pi(T_1 - T)}{T_1}$$



$\boxed{50\%}$

45%

60%

"(Phase and frequency)"

$$\text{Duty Cycle} = \frac{T_{high}}{T_{High} + T_{low}}$$

$$V = A\sin(\omega t)$$

$$\phi(t) = \int \omega(t) \cdot dt \Rightarrow \text{Instantaneous freq}, \ \omega(t) = \frac{d\phi(t)}{dt}$$