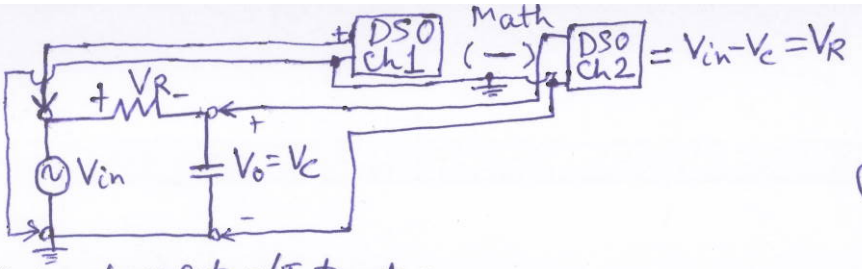
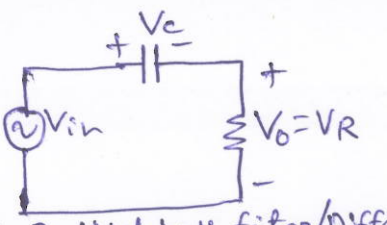
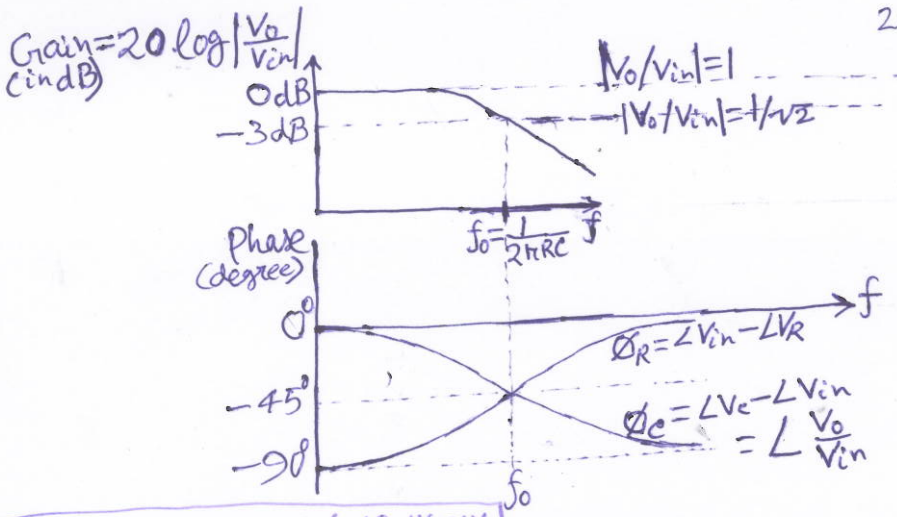
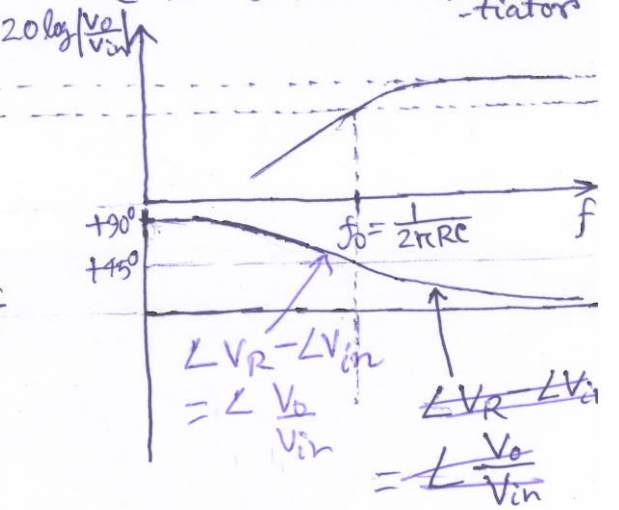


R-C Low pass fiter/Integrator



C-R High pass fiter/Differen-tiator





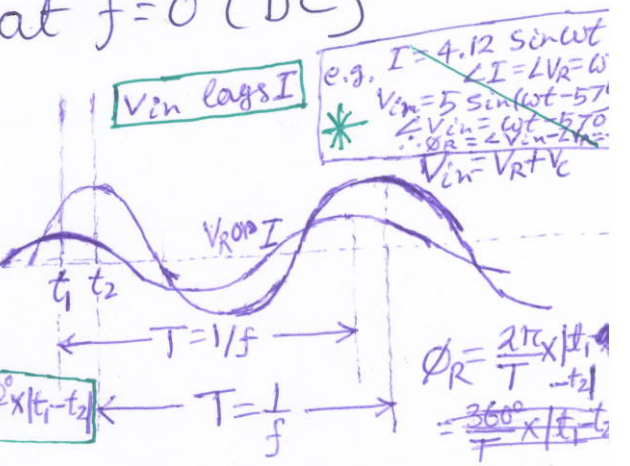
* e.g. $I = 4.12 \sin \omega t$, $\angle I = \angle V_R = \omega t$
$V_{in} = 5 \sin(\omega t - 57°)$
$\angle V_{in} = \omega t - 57°$
$\therefore \phi_R = \angle V_{in} - \angle V_R = -57°$

Phasor diagram at different frequency

$I = 0, V_R = 0$

at $f = 0$ (DC)

$\vec{V_c} = \vec{V_{in}}$

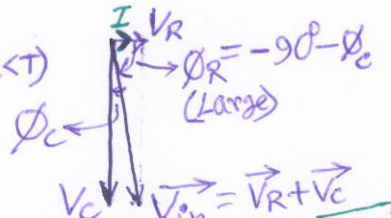


at $f < f_o$ (i.e. $RC < T$)

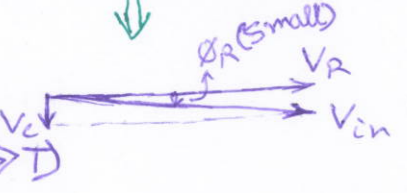
Gain (R-C) $= \left|\frac{V_c}{V_{in}}\right| \approx 1$

Gain (C-R) $= \left|\frac{V_R}{V_{in}}\right| \ll 1$

C-R works as differentiator,
i.e. $V_o = V_R = RC \frac{dV_{in}}{dt}$



Increase frequency, $\downarrow V_c \to 0$, $V_R \uparrow$, $\downarrow \phi_R \to 0°$

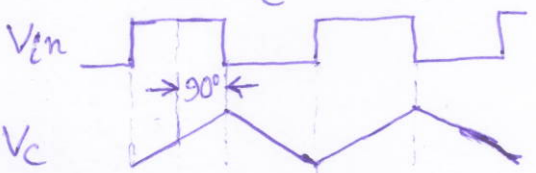


at $f \gg f_o$ (i.e. $RC \gg T$)

Gain (C-R) ≈ 1

Gain (R-C) $\ll 1$, R-C works as Integrator, i.e. $V_o = V_c = \frac{1}{RC} \int V_{in} dt$,

$\angle V_c - \angle V_{in} \approx -90°$



at $f = \infty$

Reference Text: Frequency Response ⇒ Milman's Integrated Electronics (page 417-428)
Integrator and Differentiator ⇒ SMITH & DORF (page 99-100)