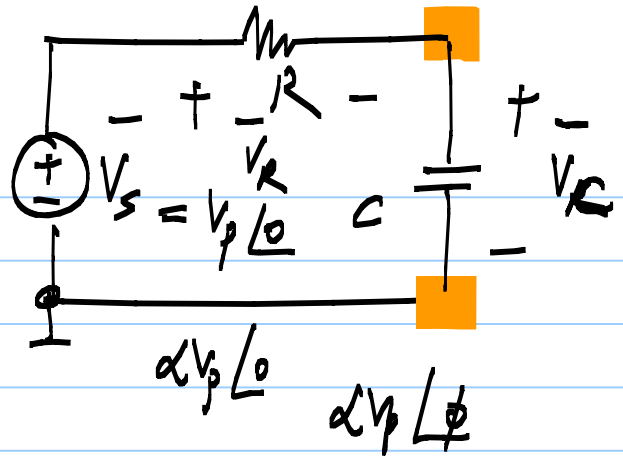
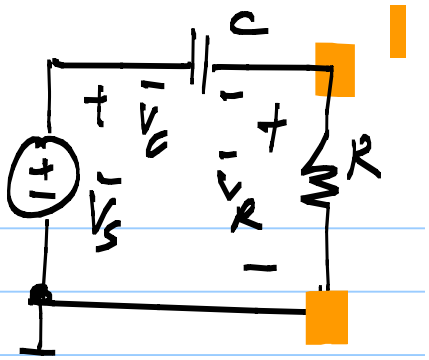
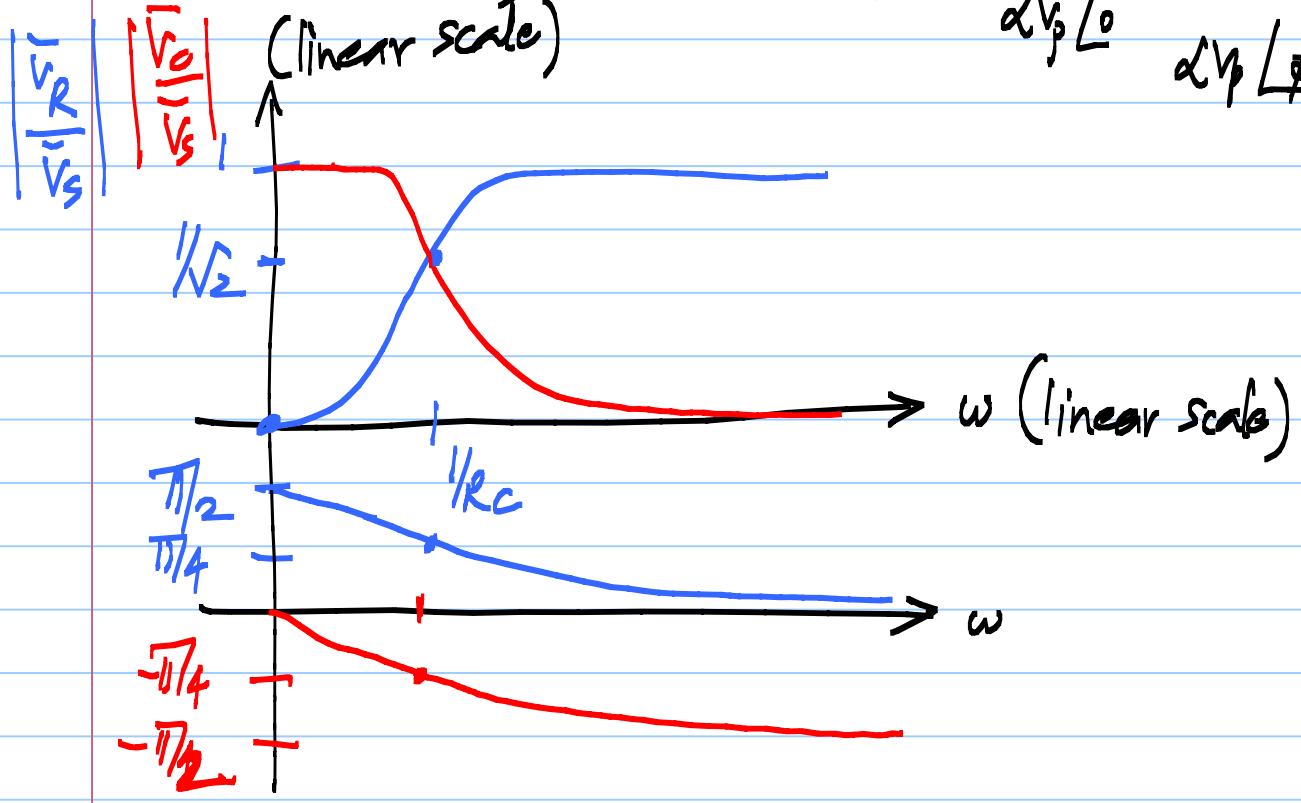
EC1010: Lecture 32

$\bar{V}_R$, $\bar{V}_o$; $\bar{V}_R/\bar{V}_s$, $\bar{V}_o/\bar{V}_s$







Plots of log magnitude and phase versus log · ω

$$\frac{\bar{V}_o}{\bar{V}_s} = \frac{1}{1 + j\omega CR}$$

$$\left|\frac{\bar{V}_c}{\bar{V}_s}\right| = \frac{1}{\sqrt{1 + (\omega CR)^2}}$$

$$\simeq 1 \qquad \omega \ll 1/RC$$

$$\simeq \frac{1}{\omega CR} \qquad \omega \gg 1/RC$$

$$\log\left|\frac{\bar{V}_c}{\bar{V}_s}\right| = \log\left[\frac{1}{\sqrt{1 + (\omega CR)^2}}\right]$$

$$\simeq 0 \qquad \omega \ll 1/RC$$

$$-\log(\omega CR) \qquad \omega \gg 1/RC$$

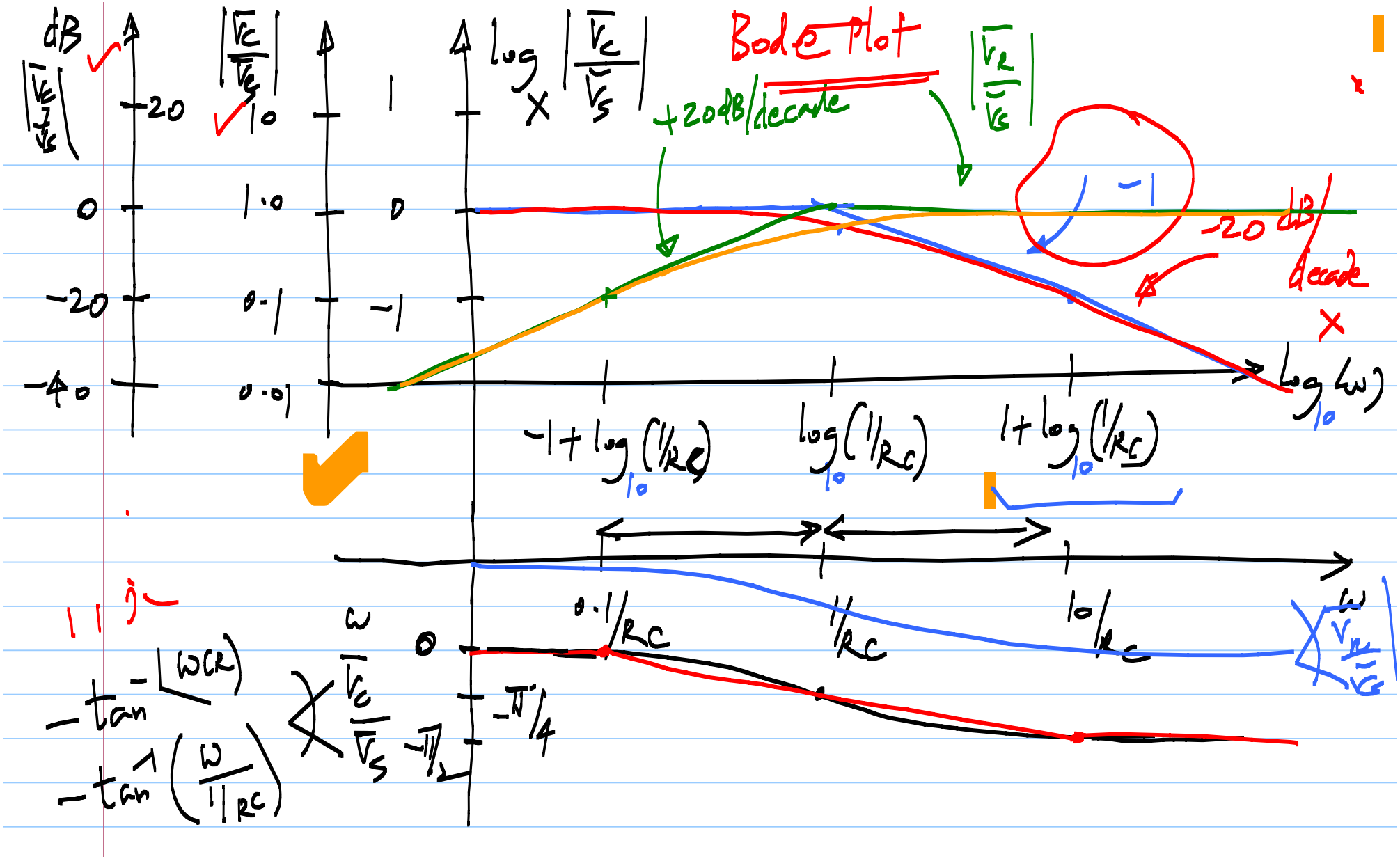
$$= -\log\omega + \log(1/RC)$$

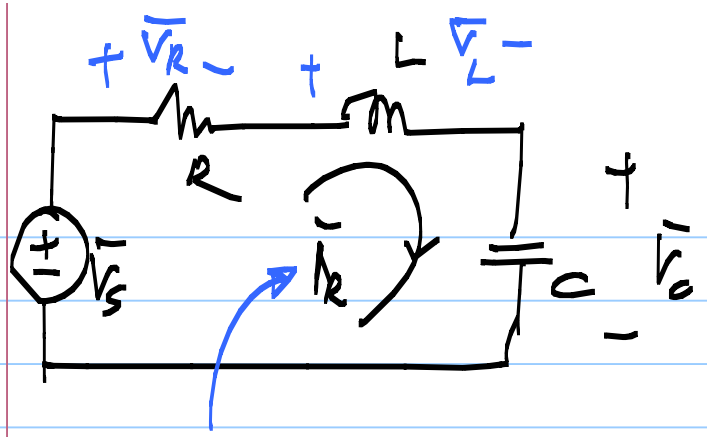
dB : (decibel) :

$$20\log_{10}\left|\frac{\bar{V}_c}{\bar{V}_s}\right| \simeq 0 \qquad \omega \ll 1/RC$$

$$-20\log(\omega CR) \qquad \omega \gg 1/RC$$

-3.01 dB $\qquad \omega = 1/RC$


Bode Plot
dB
20
0
-20
-40
1.0
0.1
0.01
1
0
-1
log
+20dB/decade
-20 dB/decade
-1 + log (1/RC)
log (1/RC)
1 + log (1/RC)
log ω
0.1/RC
1/RC
10/RC
ω
0
-π/4
-π/2
-tan⁻¹(ωCR)
-tan⁻¹(ω/1/RC)



$$\frac{\bar{V}_c}{\bar{V}_s} = \frac{1/j\omega C}{1/j\omega C + j\omega L + R}$$

$$= \frac{1}{(1-\omega^2 LC) + j\omega CR}$$

$$\simeq \left(\frac{1}{-\omega^2 LC}\right) \quad \omega \gg \frac{1}{\sqrt{LC}};$$