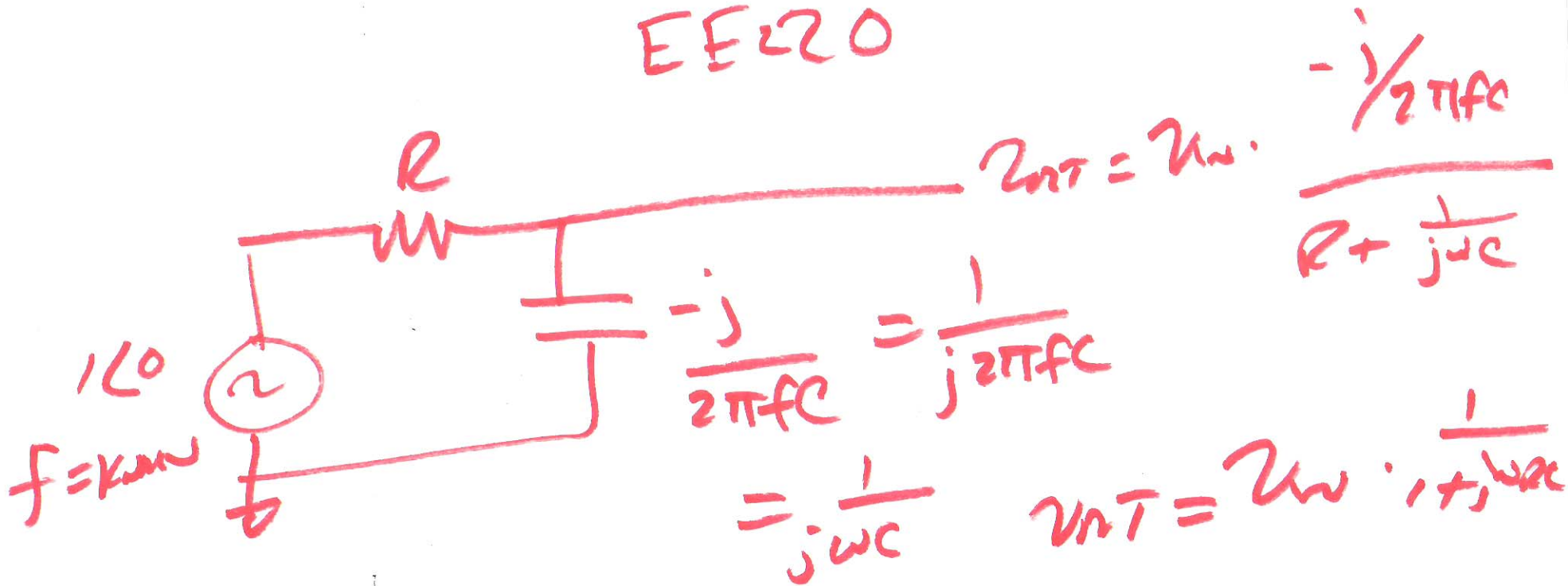


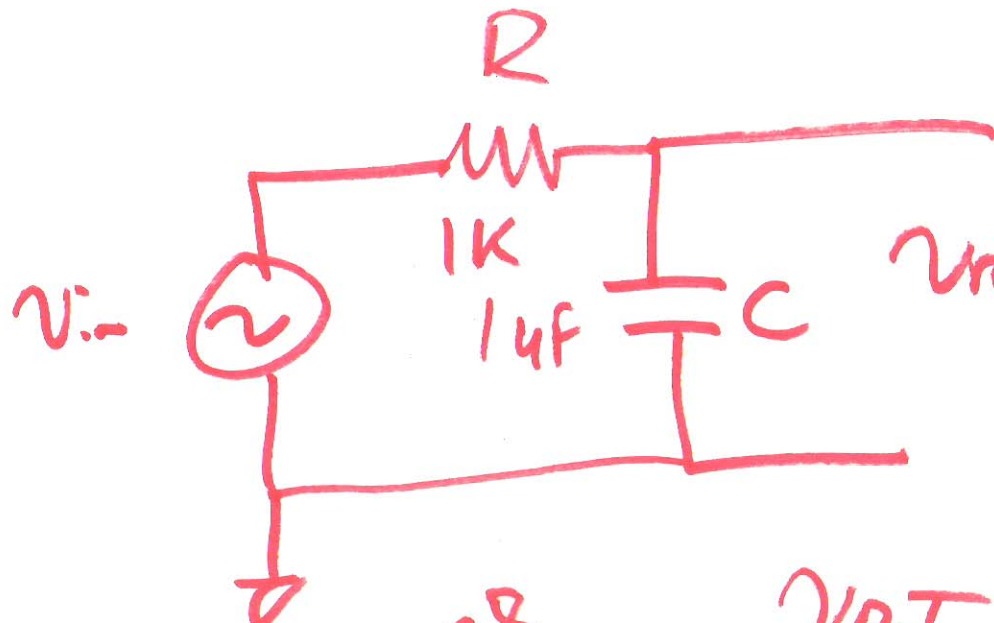
Lecture 9D

JUNE 30, 2014

EE220



1)



$$v_{out} = v_i \cdot \frac{1}{j\omega C + R}$$

$RC = 10^{-3}$
 $2\pi \cdot RC = 0.00628$
 $\frac{1}{2\pi RC} = 159 \text{ Hz}$

GAIN
 function

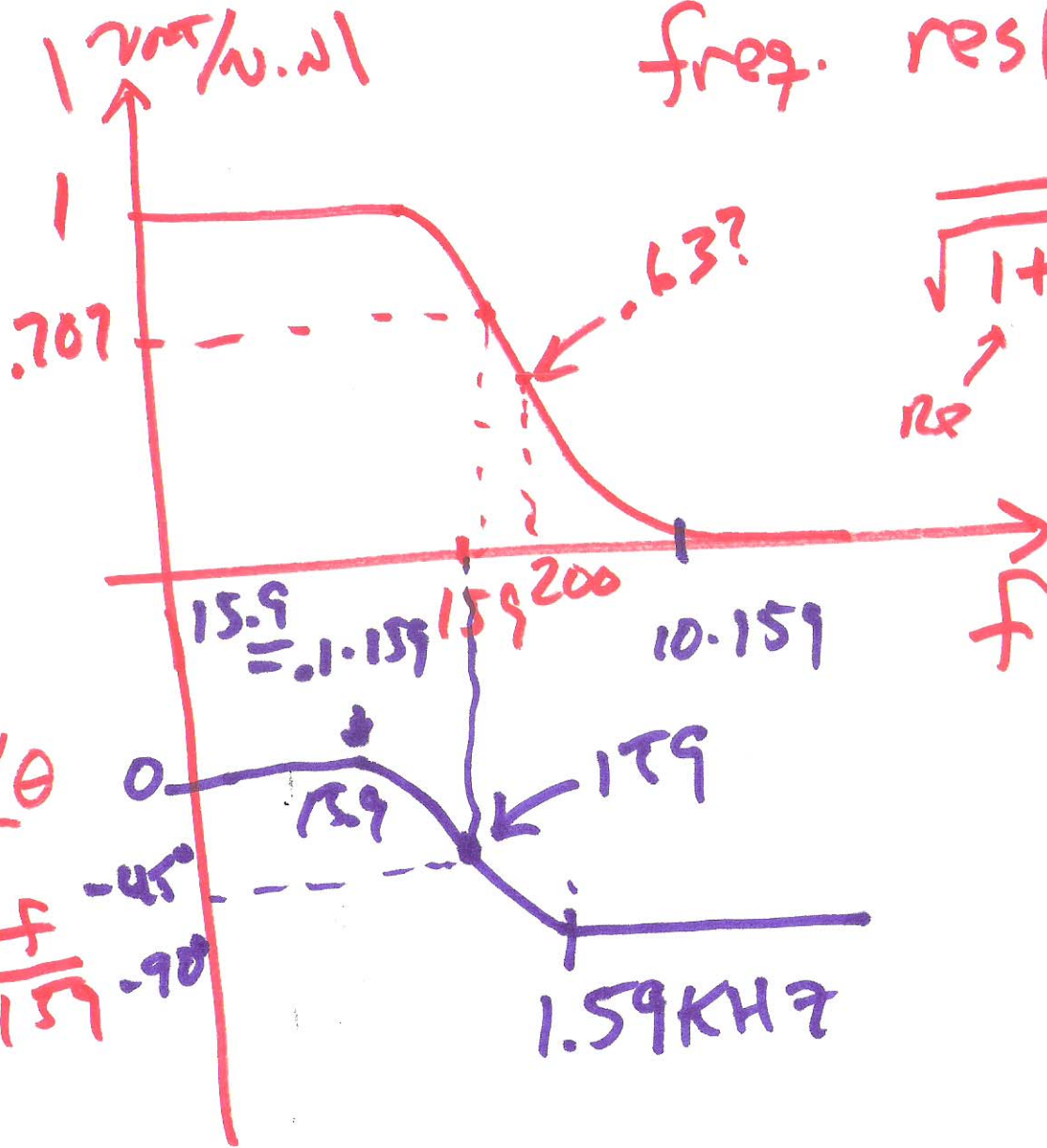
$$\frac{v_{out}}{v_i} = \frac{1}{1 + j\omega RC}$$

$$\left| \frac{v_{out}}{v_i} \right| = \frac{1}{\sqrt{1 + (2\pi f RC)^2}}$$

$$\angle \oplus = -\tan^{-1} \frac{2\pi f RC}{1}$$

2)

freq. resp



$$= \left| \frac{v_{out}}{v_{in}} \right|$$

$$\frac{1}{\sqrt{1 + \left(\frac{f}{159} \right)^2}}$$

\swarrow RE
 \nwarrow mag
 $f = 159$
 \searrow 1
 $\frac{1}{2TRC}$

@ 50

$$\frac{v_{out}}{v_{in}} = .95$$

3)

$$20 \log 10^{-1}$$

$$\frac{1}{10} \rightarrow -20 \text{ dB}$$

$$\frac{1}{100} \rightarrow -40 \text{ dB}$$

$$20 \log 10^{-2}$$

$$\frac{1}{\sqrt{2}}$$

$$20 \log \left(\frac{1}{\sqrt{2}} \right) = +3 \text{ dB}$$

$$20 \log 2 = 6 \text{ dB}$$

$$20 \log \frac{1}{2} = -6 \text{ dB}$$

$$\text{dB} = 20 \log \left(\frac{V_{\text{out}}}{V_{\text{in}}} \right)$$

voltage

$$26 \text{ dB} = 2 \times 10 = 20$$

power

$$= 10 \log \left| \frac{V_{\text{out}}^2 / R}{V_{\text{in}}^2 / R} \right|$$

$$20 \log \sqrt{2} = 3 \text{ dBm}$$

$$= 10 \log \frac{\text{OUTPUT POWER}}{1 \text{ mW}}$$

-3 dB freq.

$$0 \text{ dB} \Rightarrow \frac{V_{\text{out}}}{V_{\text{in}}} = 1$$

4)

1 decade $\times 10$ (above)
 $\div 10$ (below)

1 decade
above 1.2 Hz \rightarrow 12 Hz

1 decade
below 6 Hz \rightarrow 0.6 Hz

1 octave above
1.2 Hz \rightarrow 2.4 Hz

1 octave below
6 Hz \rightarrow 3 Hz

5)

$$-4.2 \text{ dB} = 20 \log \left(\frac{v_{\text{out}}}{v_{\text{in}}} \right)$$

$$\left| \frac{v_{\text{out}}}{v_{\text{in}}} \right| = 10^{\frac{-4.2}{20}}$$
$$= .617$$