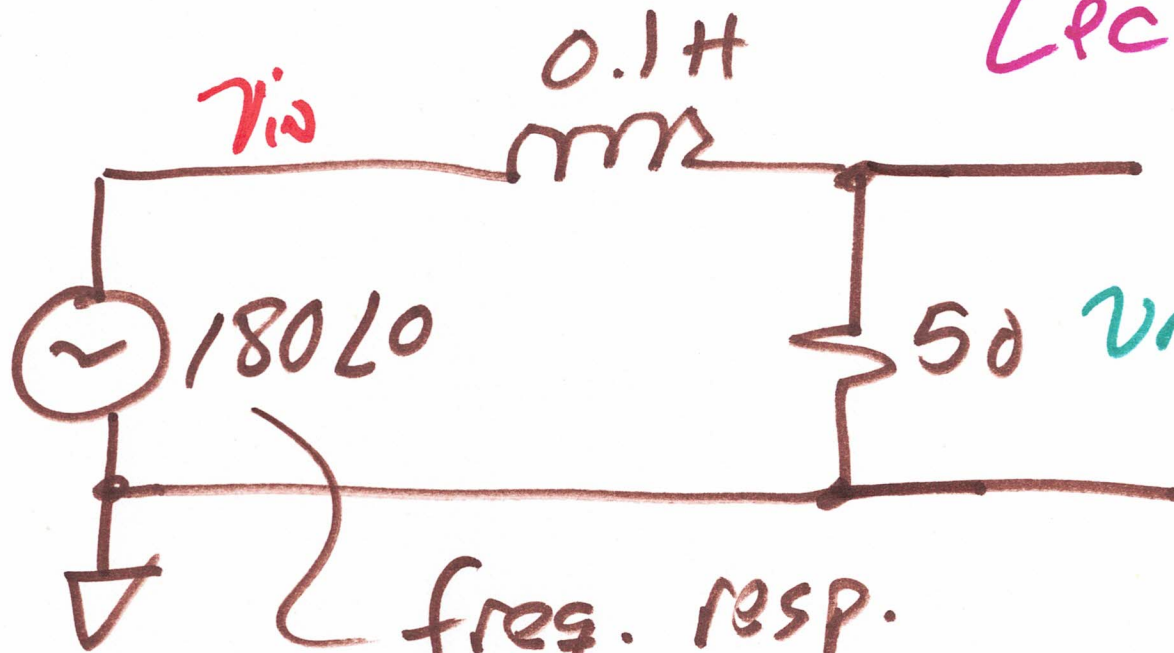


EE 221 Circuits II

March 4, 2020

Lecture 12



freq. resp.
varying f

$$V_{out} = \frac{50 \cdot 180}{50 + j2\pi f \cdot 0.1}$$

$$= \frac{180}{1 + j6.28f \cdot 0.02}$$

$$= \frac{180}{1 + j \frac{f}{79.6}}$$

$f = -79.6$ pole

$$V_{OT} = \frac{180}{1 + j \frac{f}{79.6}} \rightarrow || = \frac{180}{\sqrt{1 + \left(\frac{f}{79.6}\right)^2}}$$

$$\angle V_{OT} - \angle V_{in} \leq \angle V_{OT} = \tan^{-1} \frac{f}{79.6}$$

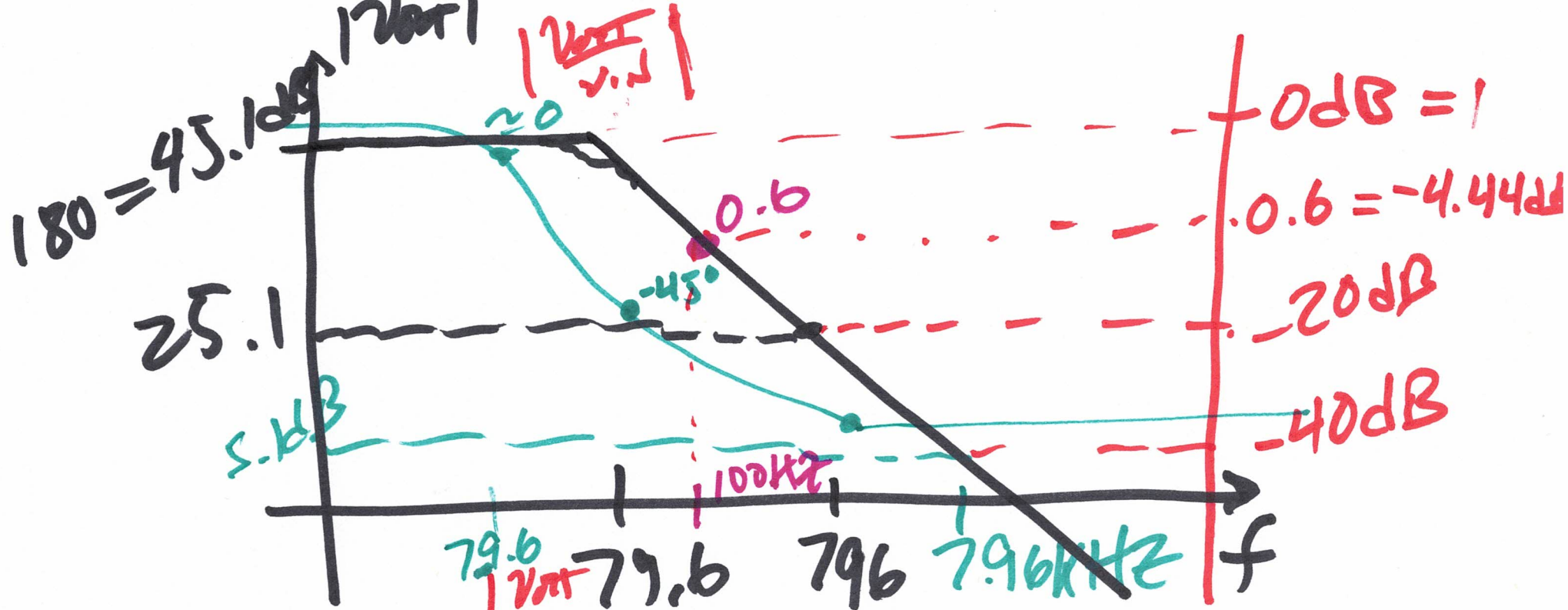
$$V_{OT} \text{ dB} = 20 \log \frac{180}{\sqrt{1 + \left(\frac{f}{79.6}\right)^2}}$$

$$= 20 \log 180 - 20 \log \sqrt{1 + \left(\frac{f}{79.6}\right)^2}$$

$$- 20 \log \sqrt{1 + \left(\frac{79.6 \cdot 100}{79.6}\right)^2}$$

$$- 20 \text{ dB} \approx - 20 \log \sqrt{101}$$

2)



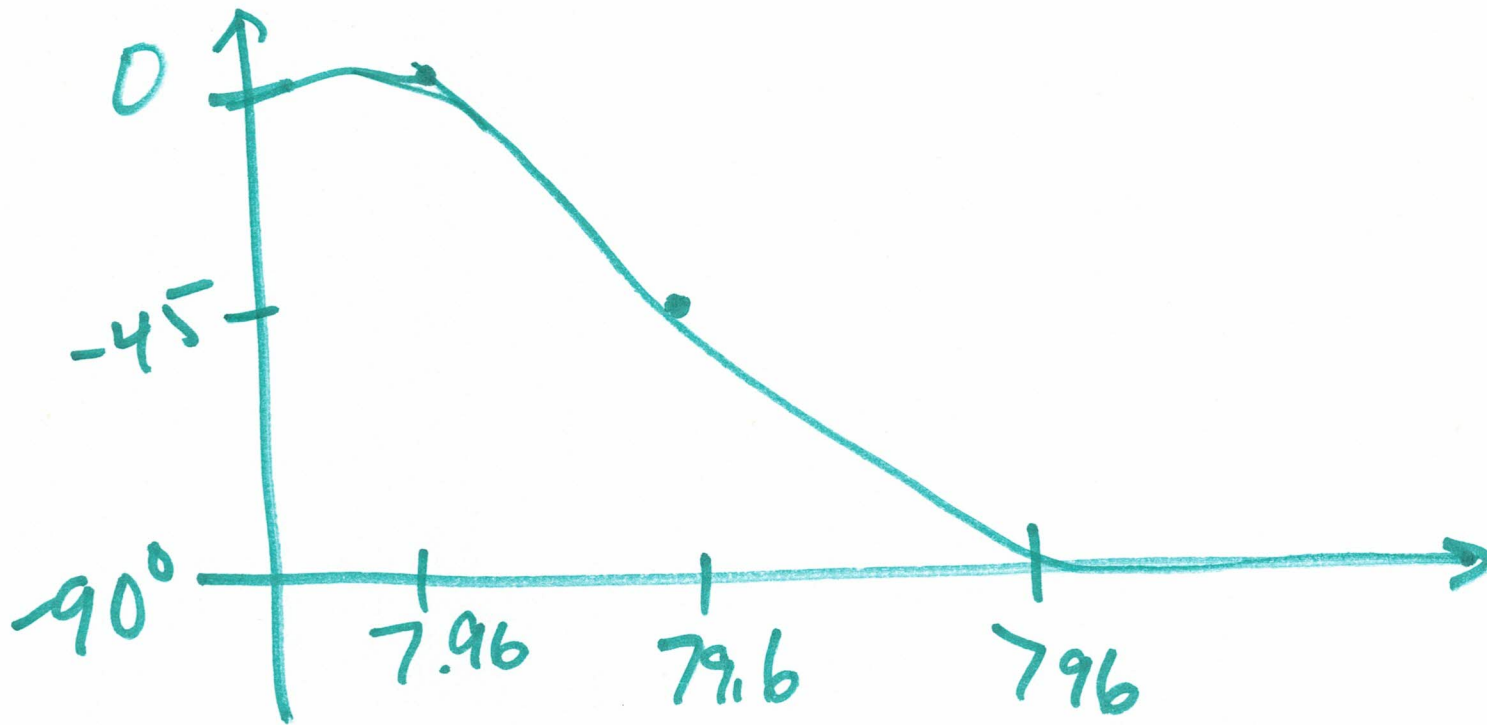
$\angle \frac{V_{out}}{V_{in}} = -37$
 $V_{in} =$
 $\angle \frac{V_{out}}{V_{in}} = 0.6$
 $100mV$
 $V_{out} = 60mV$

$\angle V_{out} - \angle V_{in}$

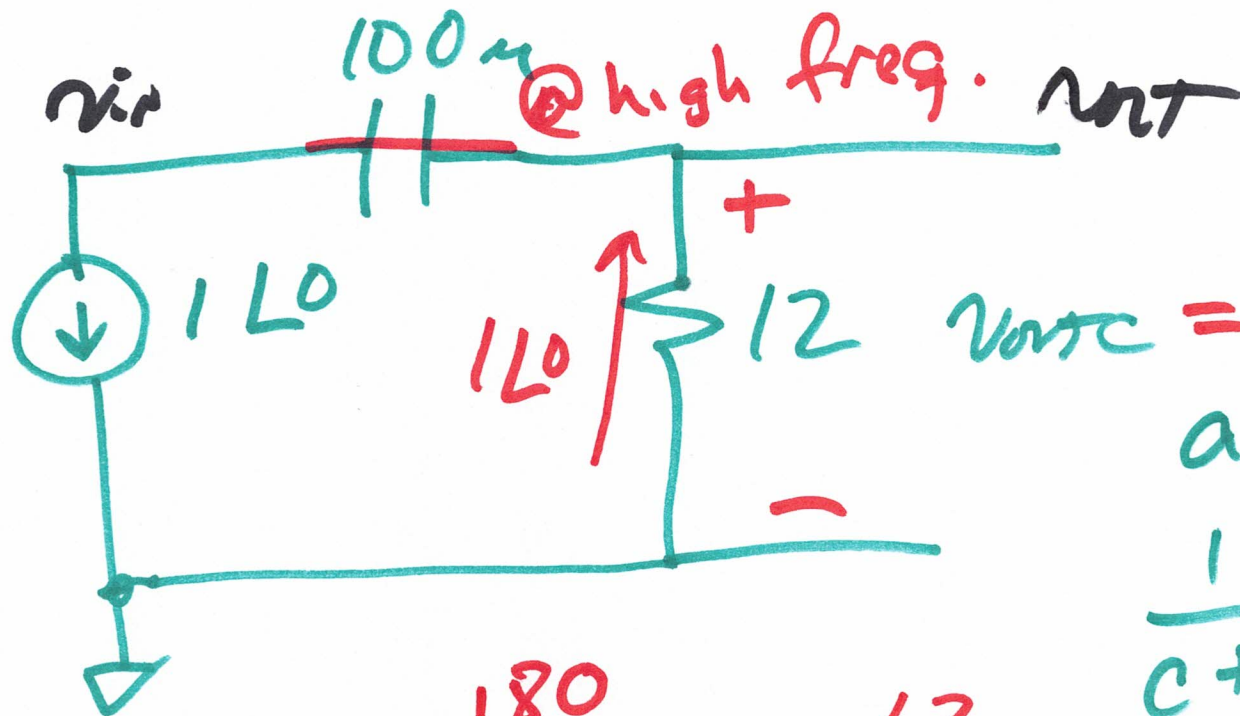
$V_{out}(t) = 60mV \cos(2\pi 100t + \theta)$

3)

$$\angle V_{out} = -\tan^{-1} \frac{f}{79.6}$$



4)



$V_{out} = 12 \angle 180^\circ$
 $a + jb$

$\frac{1}{c + jd}$

$j \cdot \omega \cdot 10^3$

$V_{out} = 1 \angle 0^\circ \cdot \frac{12}{12 + \frac{1}{j 2\pi f \cdot 10^{-4}}}$

$\frac{j \omega \cdot 10^{-4}}{1}$

$= \frac{j \frac{f}{133}}{1 + j \frac{f}{133}}$

$133 = \frac{1}{12 \cdot 6.28 \cdot 10^4}$

5)

$$\frac{j \cdot 2\pi f \cdot 10^{-4} \cdot 12}{1 + j \cdot 2\pi f \cdot 10^{-4} \cdot 12}$$

$$= \frac{j f (7.54 \times 10^{-3})}{1 + j f (7.54 \times 10^{-3})}$$

$$\frac{1}{7.54 \times 10^{-3}} = 133 \text{ Hz}$$

$$V_{OT} = \frac{j \frac{f}{133}}{1 + j \frac{f}{133}}$$

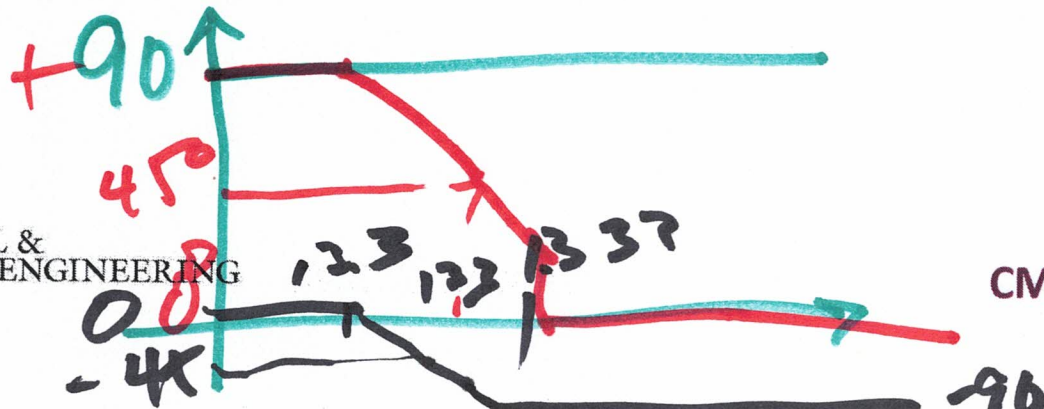
6)

$$V_{out} = \frac{0 + j \frac{f}{133}}{1 + j \frac{f}{133}}$$

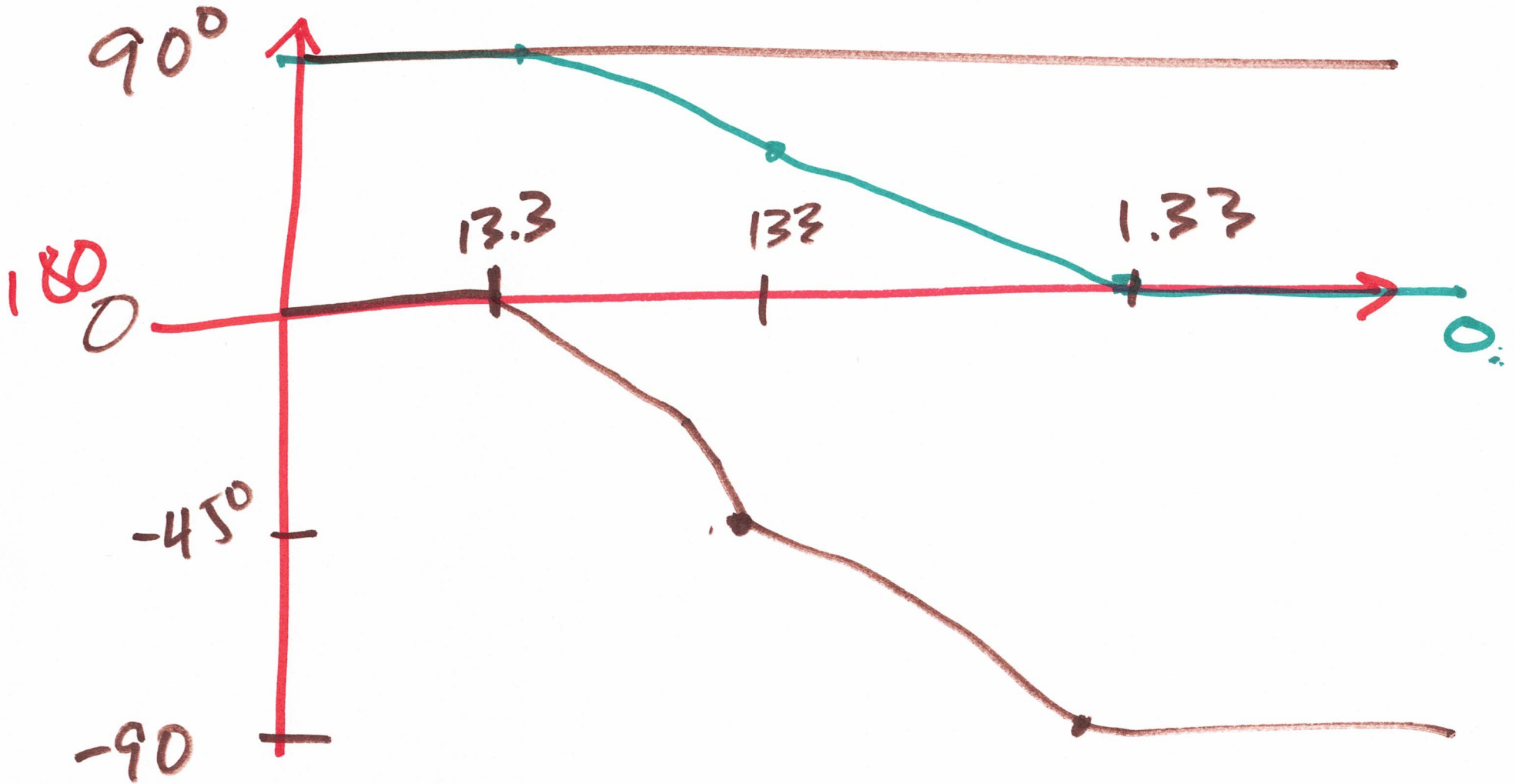
$$\angle V_{out} = \cancel{\tan^{-1} \frac{f}{0}} - \tan^{-1} \frac{f}{133}$$

↘ 90°

$$\angle V_{out} = 90 - \tan^{-1} \frac{f}{133}$$



$$\angle_{\text{UNT}} = 90 - \tan^{-1} \frac{f}{133}$$



8)

$$V_{out} = \frac{j \frac{f}{133}}{1 + j \frac{f}{133}}$$

$$|V_{out}| = \frac{f}{133}$$

