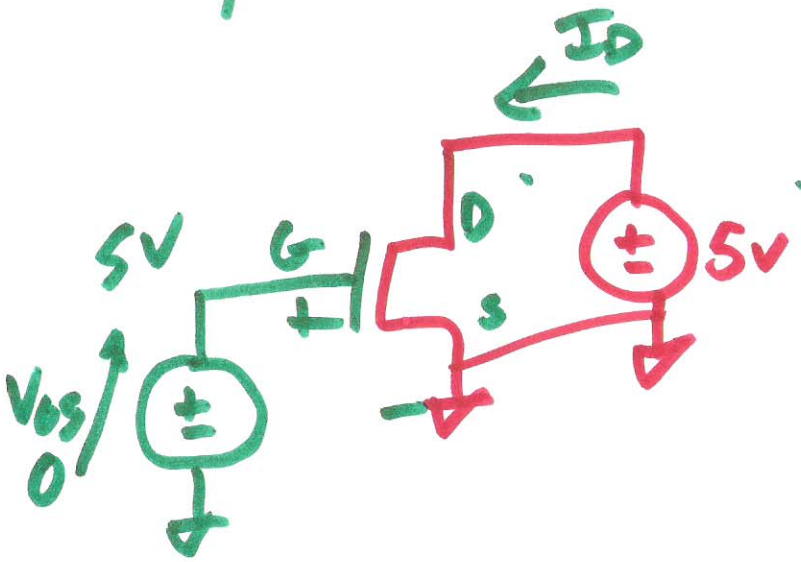
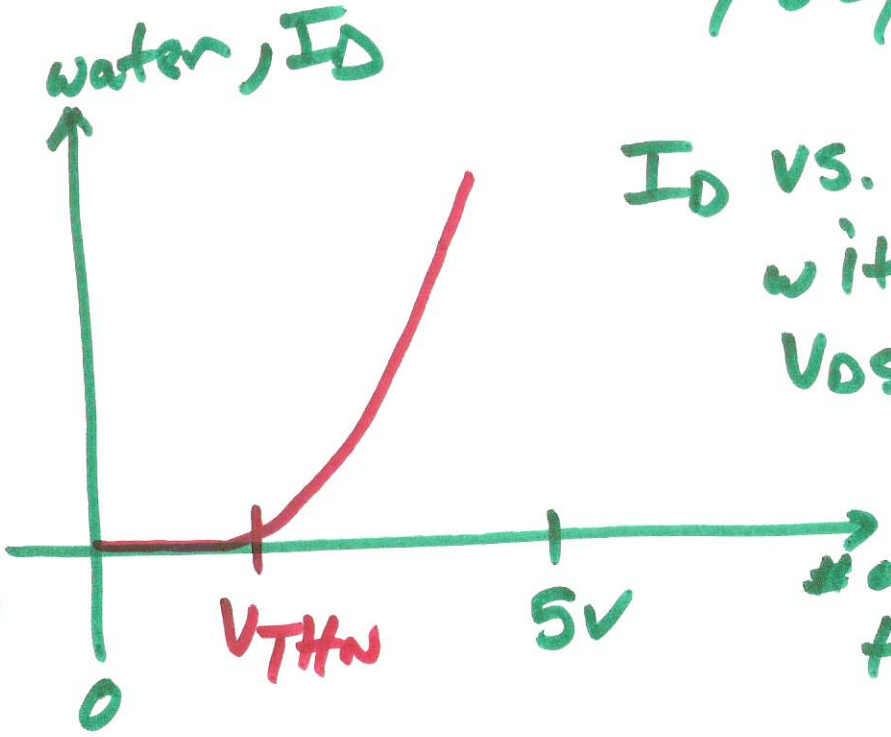
EE 422 EGG 622
Analog IC Design
Lecture 3
1/30/2013





I_D vs. V_{GS} with $V_{DS} = 5$ = Const.

$$I_D = \frac{B_N}{2}\left(V_{GS} - V_{THN}\right)^2$$

$V_{DS} > V_{GS} - V_{THN}$

$V_{GS} > V_{THN}$

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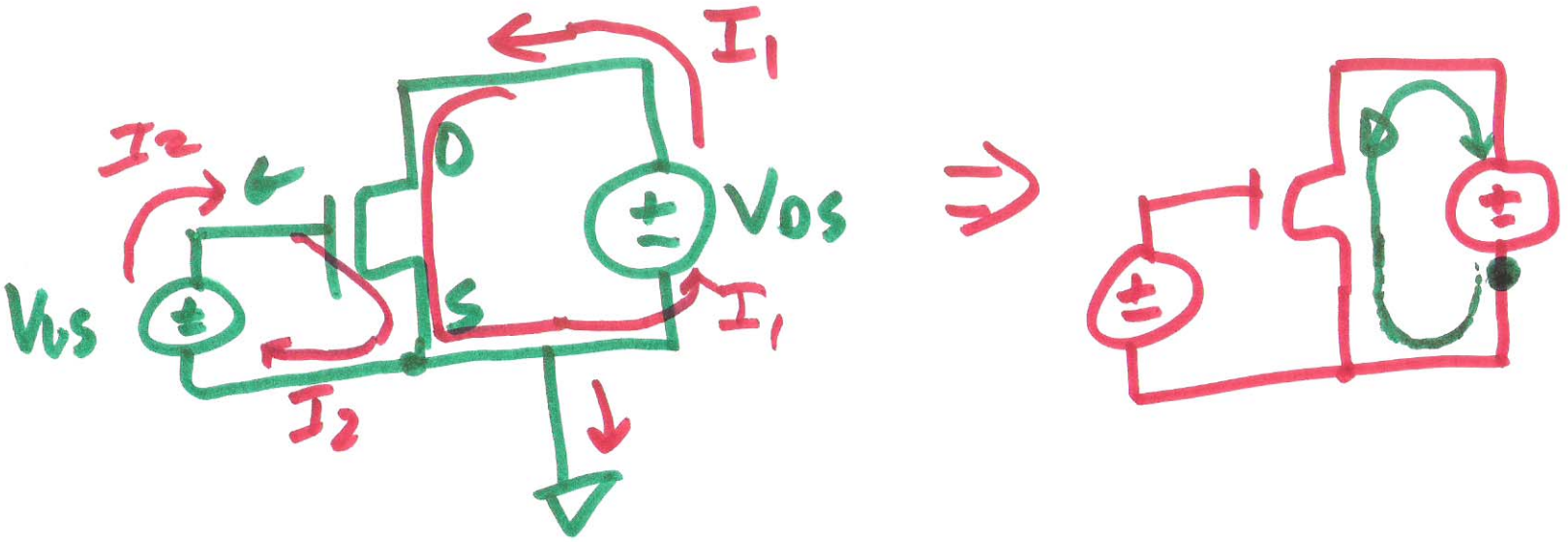
Transconductance parameter

$$KP_N = \mu_N \cdot C_{ox}' = \mu_N \cdot \frac{\varepsilon_{ox}}{t_{ox}}$$

$$\beta_N = KP_N \cdot \frac{W}{L} = \mu_N \cdot C_{ox}' \cdot \frac{W}{L} = \mu_N \cdot \frac{\varepsilon_{ox}}{t_{ox}} \cdot \frac{W}{L}$$



$V_{GS} \geq V_{THN}$

(VALVE ON)

water, I_D

water

V_{DS} = CNST

SATURATION

$I_D = \frac{\beta_N}{2}(V_{GS} - V_{THN})^2$

pressure, V_{DS}

$V_{DS} = V_{GS} - V_{THN}$

for SAT

$V_{DS} \geq V_{GS} - V_{THN}$

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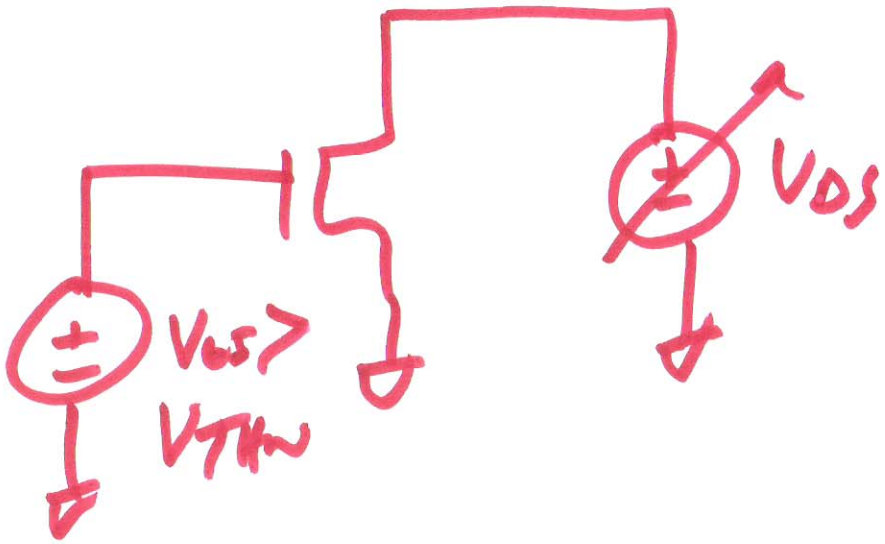

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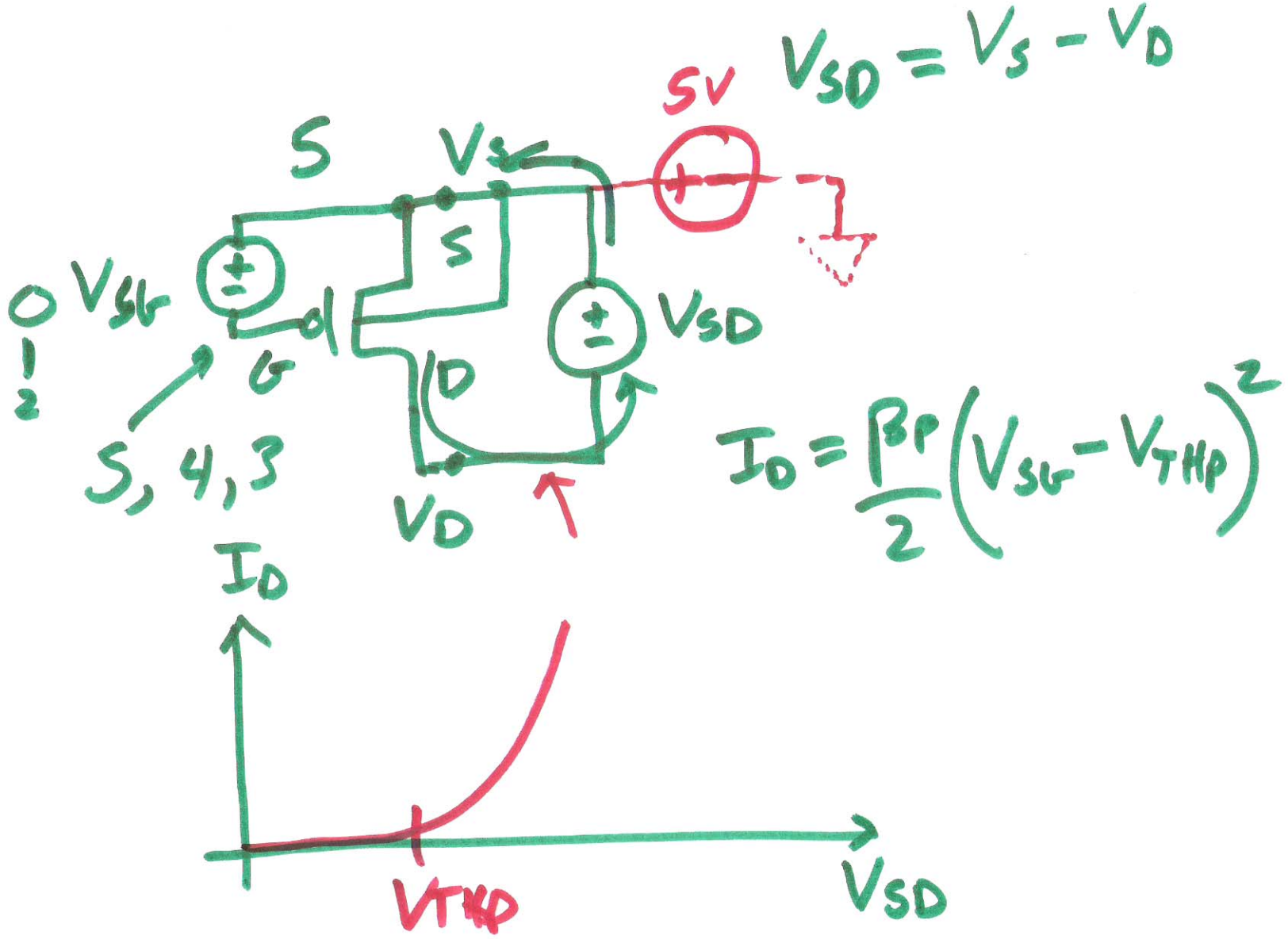

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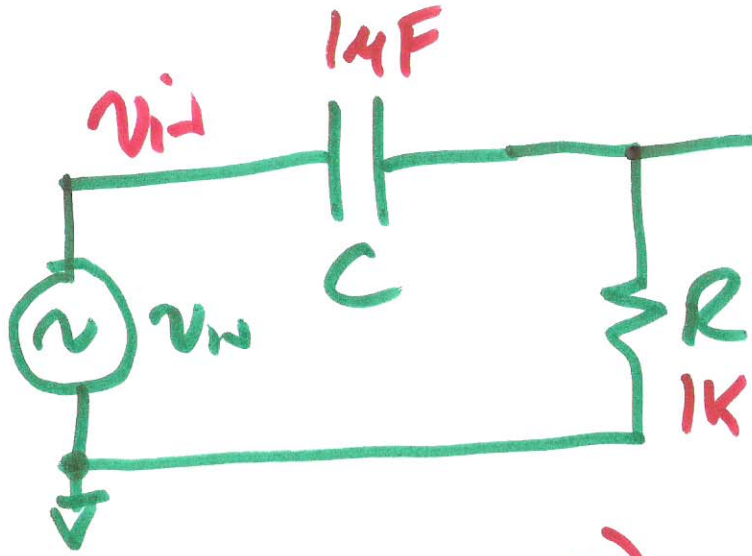

$$v_{out} = v_{in} \cdot \frac{R}{R + 1/sC}$$

$$\frac{v_{out}}{v_{in}} = \frac{0 + jwRC}{1 + jwRC}$$

$v_{in} = 1V \cdot \sin(2\pi \cdot 200 \cdot t)$

$v_{out} = ?$

$$\left|\frac{v_{out}}{1}\right| = |v_{out}| =$$

mag of v_{in} (.4π)

$$= \frac{0 + j2\pi \cdot 200}{1 + j \cdot 4\pi}$$

$1K \cdot 1\mu F = 10^{-3}$

$\frac{\pi}{2}$ 90 52°

$L = \tan^{-1}\infty - \tan^{-1}\frac{4\pi}{1\ 3}$

$90 - 52 = 38°$

$$|v_{out}| = \frac{.4\pi}{\sqrt{1^2 + (.4\pi)^2}}$$

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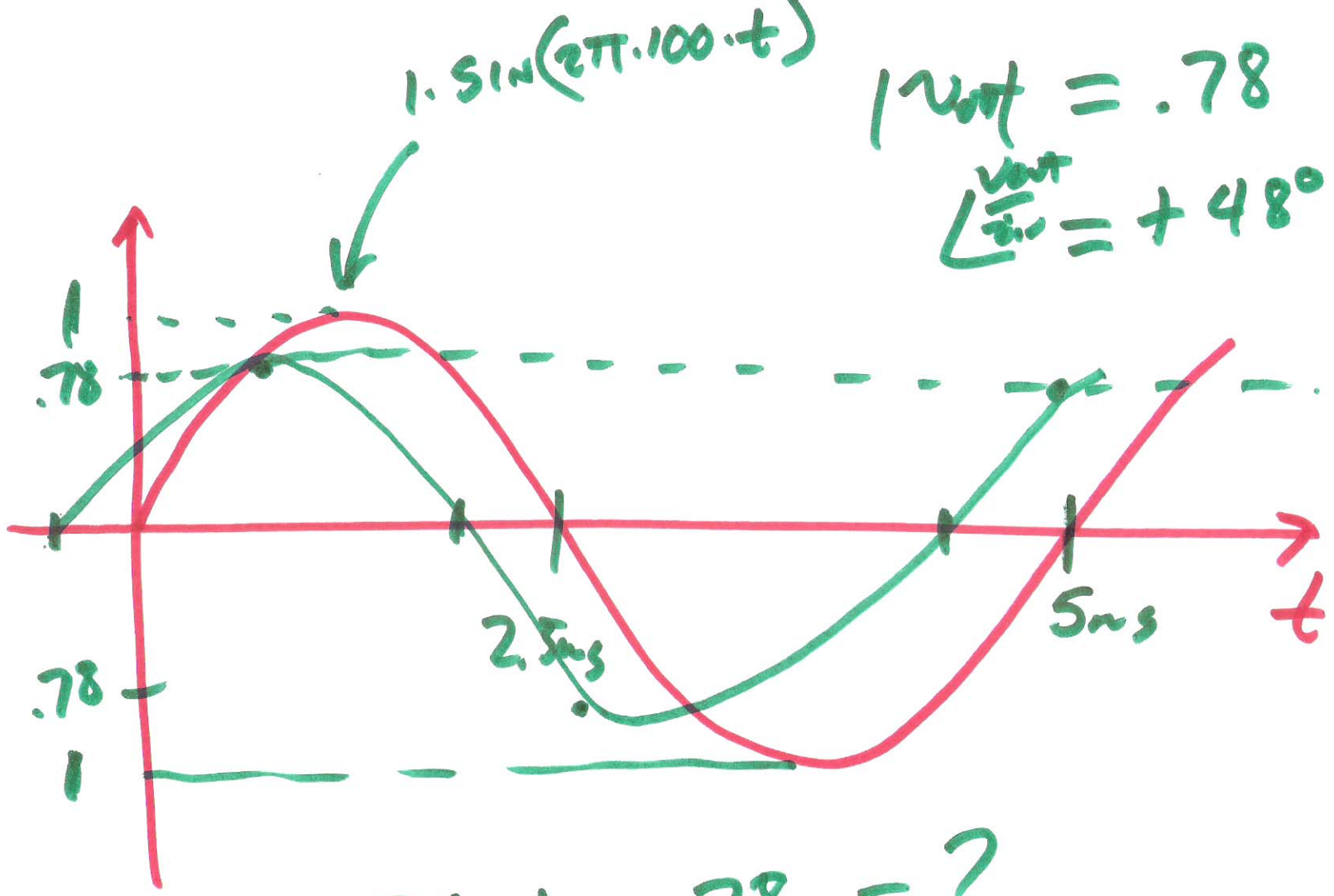
6)



$1_{\angle 0^\circ} = .78_{\angle +48^\circ}$

$20 \log .78 = ?$

$= -2.16\,dB$

@ 200 Hz

$$38 = \frac{\Delta t}{5ms} \cdot 360$$

$$\Delta t = \frac{38}{360} \cdot 5ms$$

$$\approx \cdot \text{[illegible]}$$

$$= \text{[illegible]}$$

$$\approx \frac{1}{2} ms$$

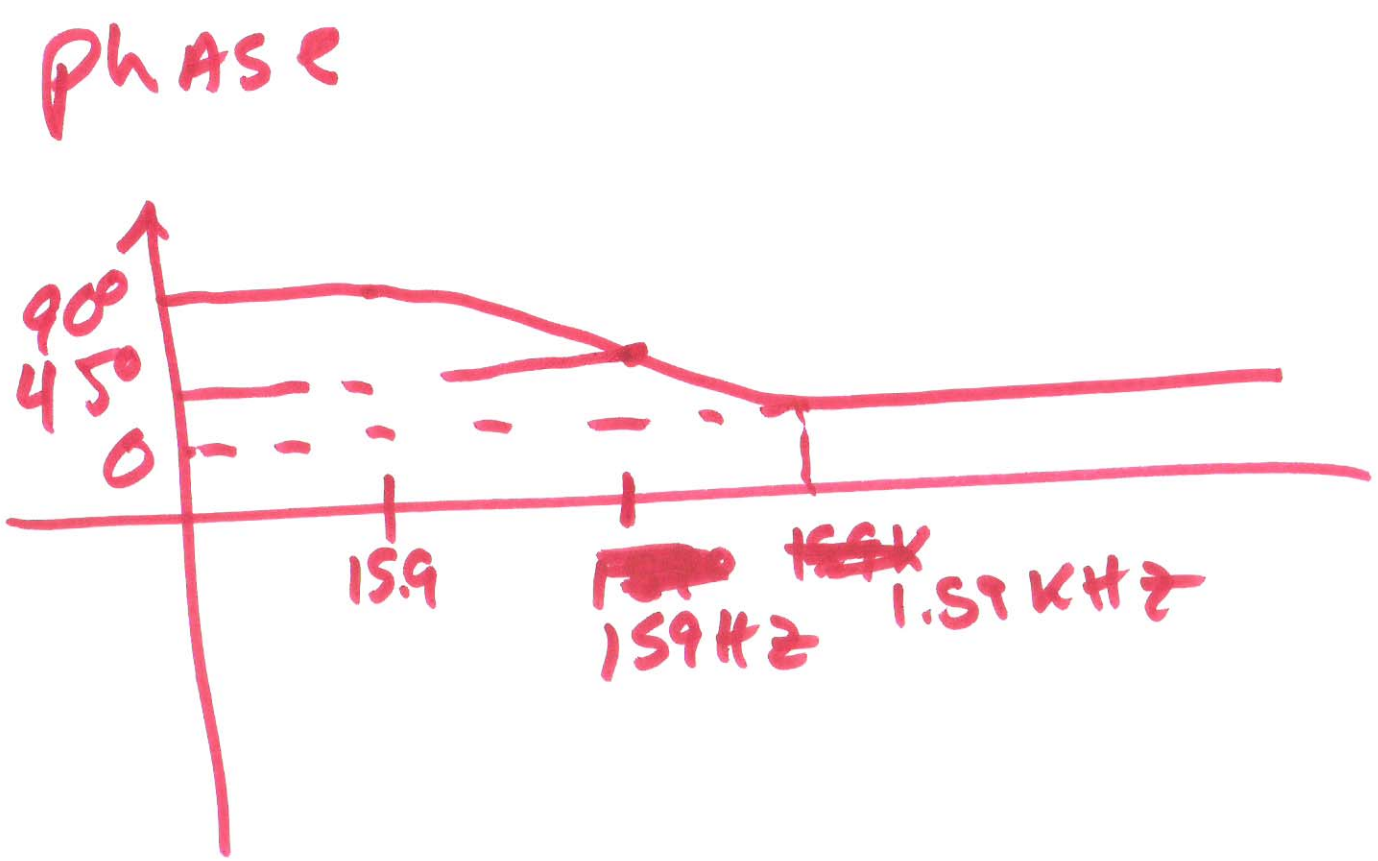
$$90 - \tan^{-1} 2\pi RCf$$

$$\uparrow$$

$$\frac{0 + j2\pi RC \cdot f}{1 + j2\pi RC \cdot f}$$

$$|\cdot| = \frac{2\pi RCf}{\sqrt{1^2 + (2\pi RCf)^2}}$$

$$f = \frac{1}{2\pi RC}$$



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