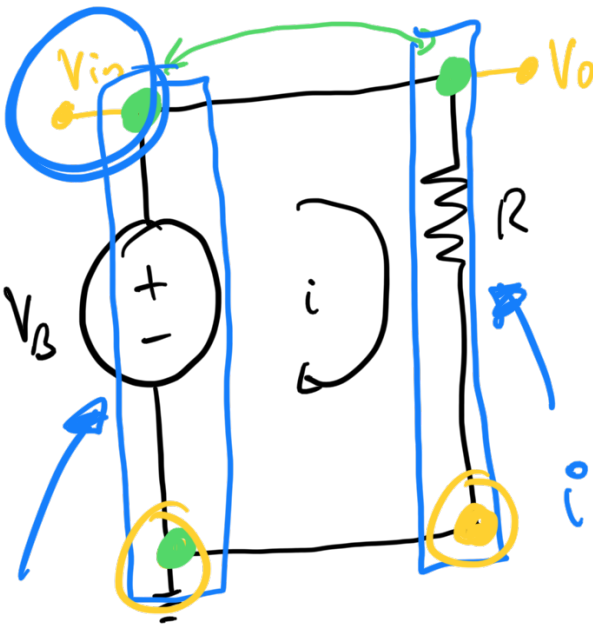
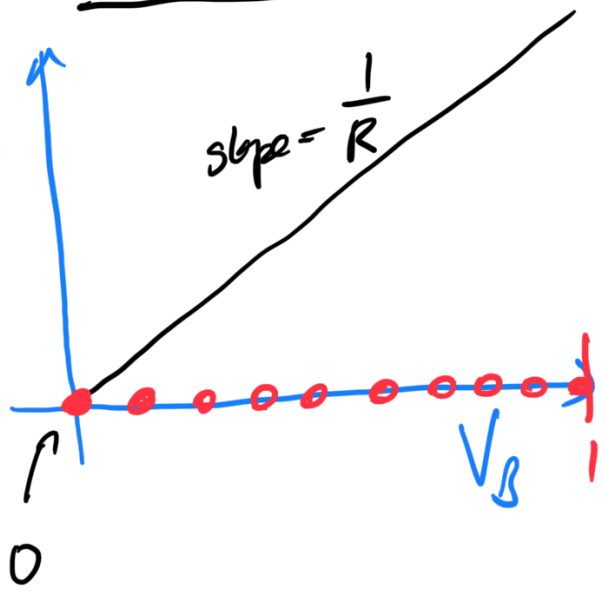
Physics 421 - Lecture 29

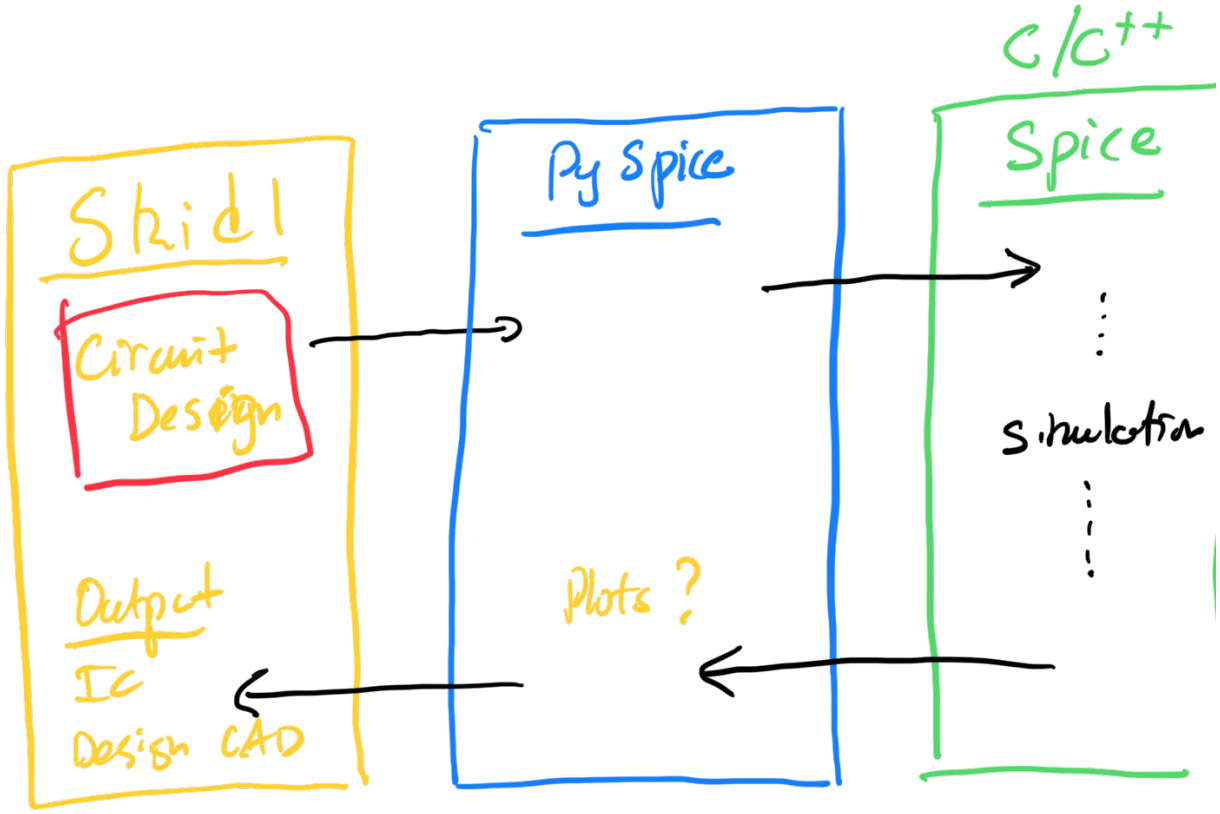
→ DC circuit analysis

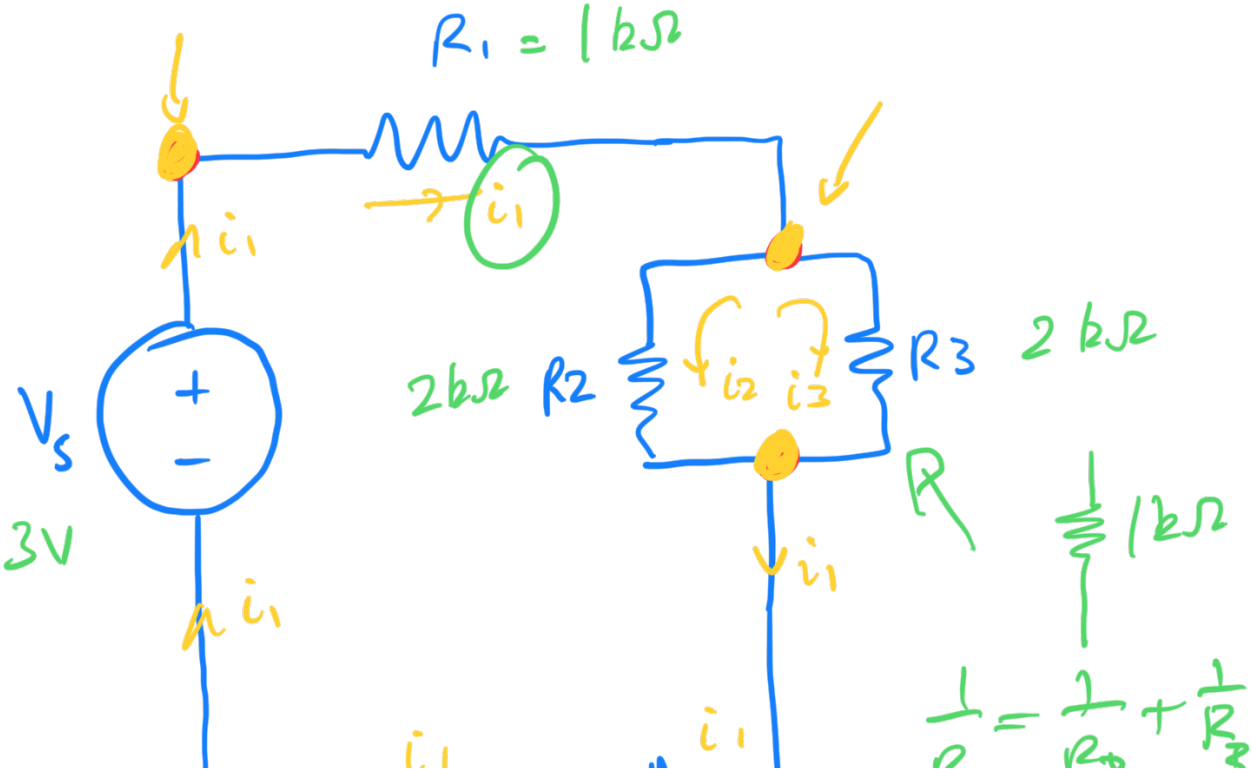


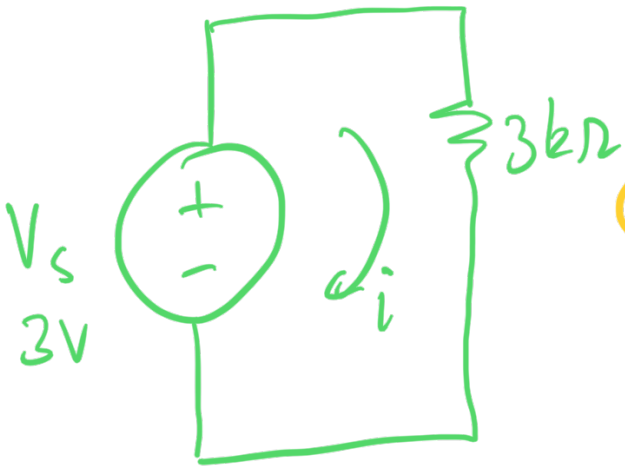
$$i = \frac{V_B}{R}$$



Skidl


C/C++
Spice
PySpice
Skidl
Circuit Design
simulation
Plots ?
Output
IC
Design CAD


R1 = 1 kΩ
i1
2kΩ R2
i2 i3
R3 2 kΩ
Vs
3V
R
1kΩ

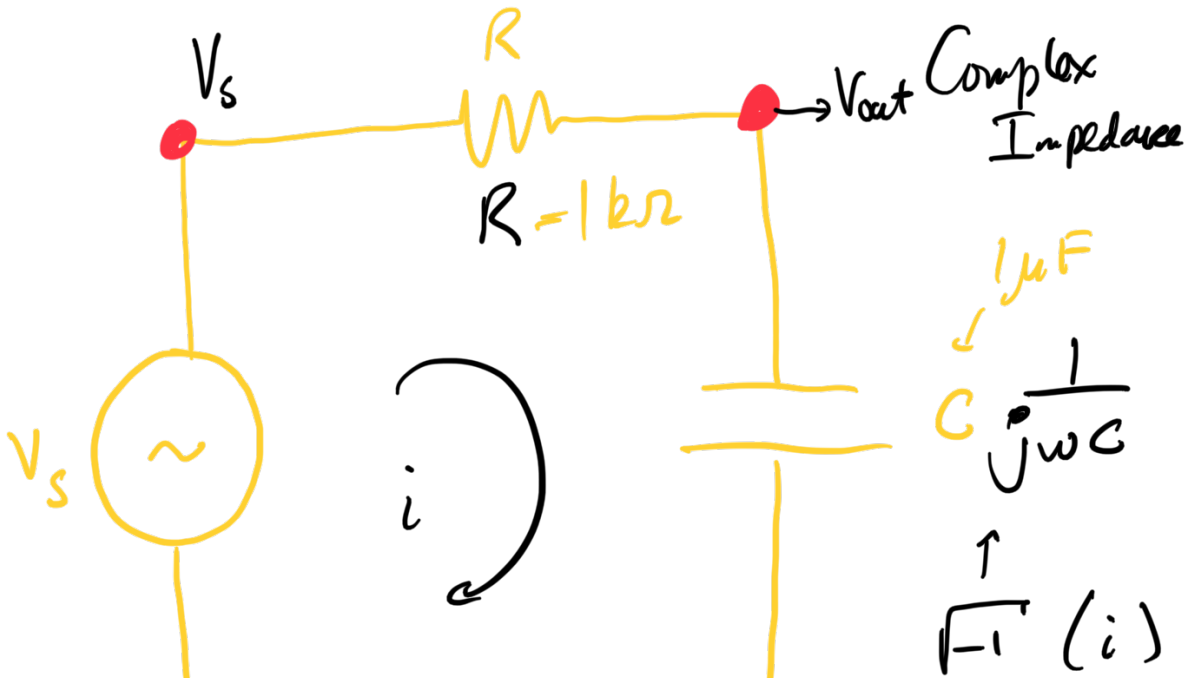


$i_1 = 1\,mA$

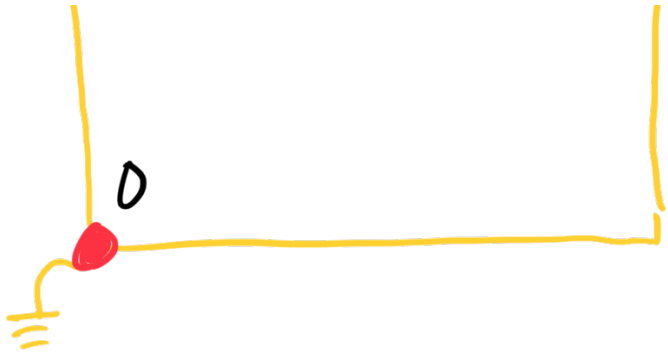
$i_2 = 0.5\,mA$

$i_3 = 0.5\,mA$

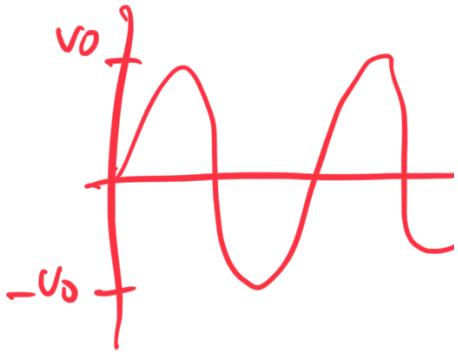
AC circuit analysis.



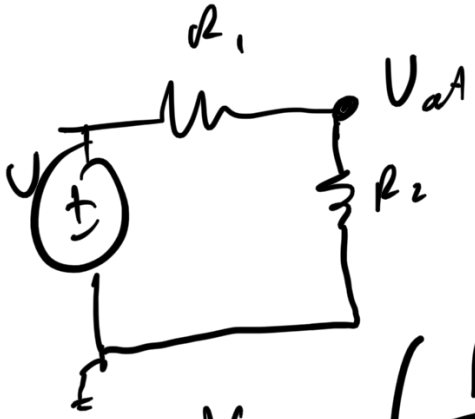
Complex Impedance.



$$V_s = V_0 \sin(\omega t)$$



$$V_{out} = V_s \left(\frac{1/j\omega C}{\frac{1}{j\omega C} + R} \right)$$



$$V_{out} = V_s \left(\frac{1}{1 + j\omega RC} \right)$$

$$V_{out} = \left(\frac{R_1}{R_1 + R_2} \right) V_{in}$$

$$\tan\phi = \frac{\text{II}}{\text{IR}}$$

$$A e^{j\phi} = A(\cos\phi + j \sin\phi)$$

$Ae \;\; = \;\; A(\ldots$

$\tan(\phi) = -\omega RC \qquad \phi = \tan^{-1}(-\omega RC$

$$A = \frac{|V_s|}{\sqrt{1+\omega^2R^2C^2}}$$

$$V_{in} = V_0 \sin(\omega t)$$

$$V_{out} = A \sin(\omega t + \phi)$$

$f = 100\ \text{Hz}$

$\omega = 2\pi f = 200\pi$

$V_0 = 1\ \text{V}$

$t = [0, 40\ \text{ms}, 0.01\ \text{ms}]$

time constant $\equiv RC$

$$= (1000)(10^{-6})$$

$$= 10^{-3} = 1\,ms$$