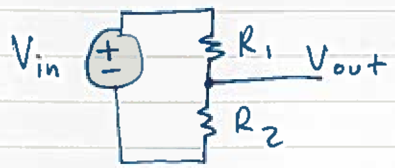
Circuits Notes — yay!

Voltage divider



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

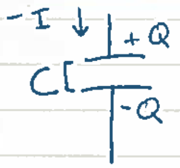
also... $V_{out} = IR$
$= V_{in} - \frac{V_{in}}{R_1+R_2}(R_1)$

current divider

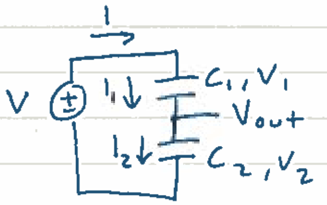
$I_{out} = \frac{V}{R_2} = \frac{R_1 \| R_2 I_{in}}{R_2}$

$= \frac{R_1 \cancel{R_2}}{R_1+R_2}\left(\frac{I_{in}}{\cancel{R_2}}\right) = I_{in}\left(\frac{R_1}{R_1+R_2}\right)$

Capacative voltage divider



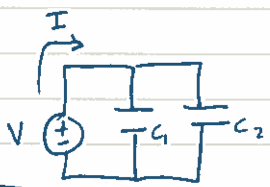
$Q = CV \quad I = C\dot{V} = \dot{Q}$ } ?? oh yeah.



$V = V_1 + V_2$
$I_1 = C_1\dot{V}_1 \,,\ I_2 = C_2\dot{V}_2$
so
$V = C_1\dot{V}_1 + C_2\dot{V}_2$

$\dot{V}_{out} = \frac{I}{C}$

$V_{out} = \int \frac{I}{C} = \int_0^t \frac{C_1 \| C_2}{C_2} \cdot V_{in}$



$\boxed{I = (C_1 + C_2)\dot{V}} = I_1 + I_2 = (C_1+C_2)\frac{dV}{dt}$
$V = V_1 = V_2$ (KVL)

Questions

- nodal analysis? → use laws that apply to nodes (KCL, KVL)
- KCL? → Kirchhoff's current law $I_1 = I_2 + I_3 \dots + I_n$
- capacative voltage divider? → $I = (C_1 + C_2 \dots + C_n)\dot{V}$
- polarized caps. why not use w/ digital voltage?

Circuits Prelab 1 — Kuby Spring

1) a. infinite, parallel
   b. zero, series

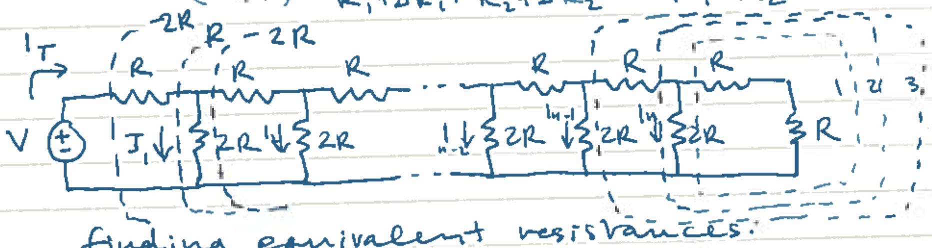
2) ~~for a current divider~~:
$V_{out} = V_{in}(R_2 / R_2 + R_1)$ ← "ideal"

$\frac{V_{out}}{V_{in}} = \frac{R_2}{R_1+R_2}$

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

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

3)



finding equivalent resistances:
1) 2R
2) $2R \| 2R \rightarrow \frac{1}{R_e} = \frac{1}{2R} + \frac{1}{2R} = \frac{2}{2R} = \frac{1}{R}$: R
3) 2R
4) R

so...
$I_T = \frac{V}{2R}$, $I_1 = I_T/2$, $I_2 = I_1/2$ $= I_T/2^2$, $\boxed{I_n = I_T/2^n}$

4) you can either use 2 resistors in series on the "rungs", or two in parallel on the "sides". Using the former saves you one resistor. Yay!

Experiments

	nominal	Keithley
1)	R : 280	279.9
	ΔR : ±1%	
	PR : 1/4 W	