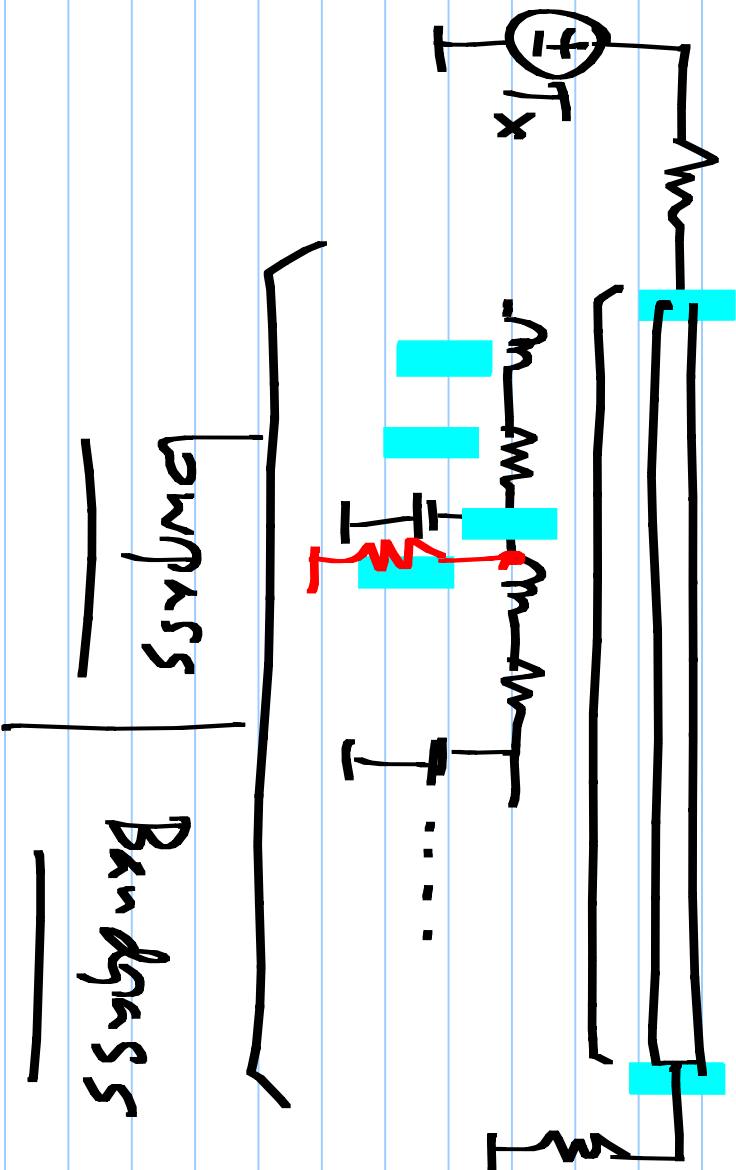


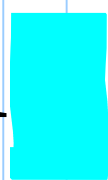
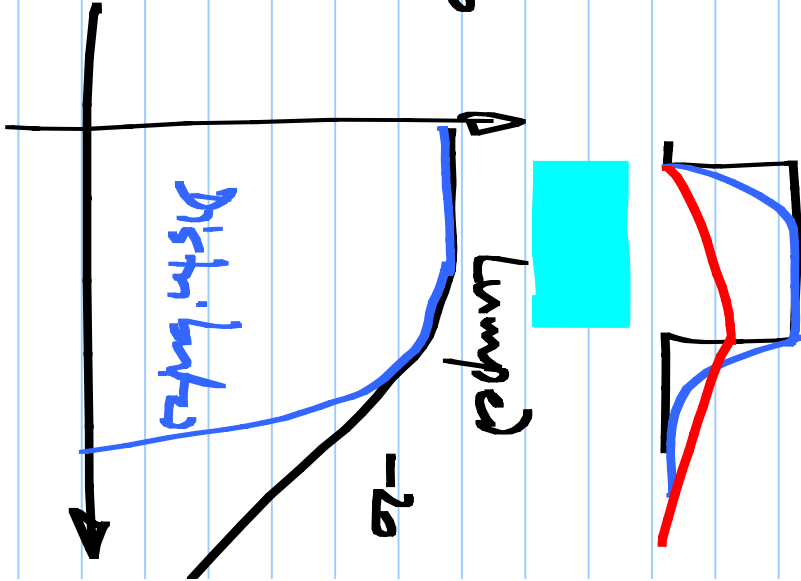
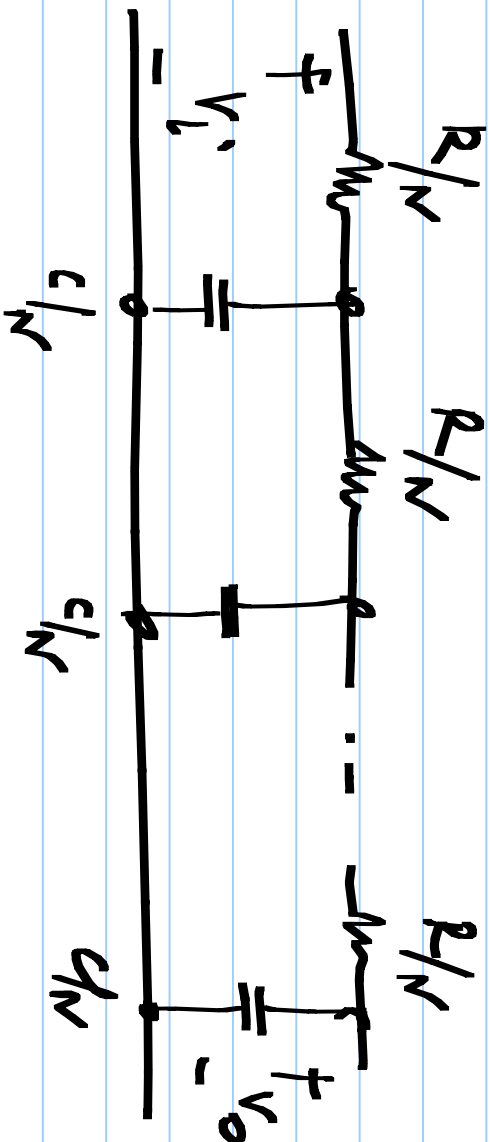
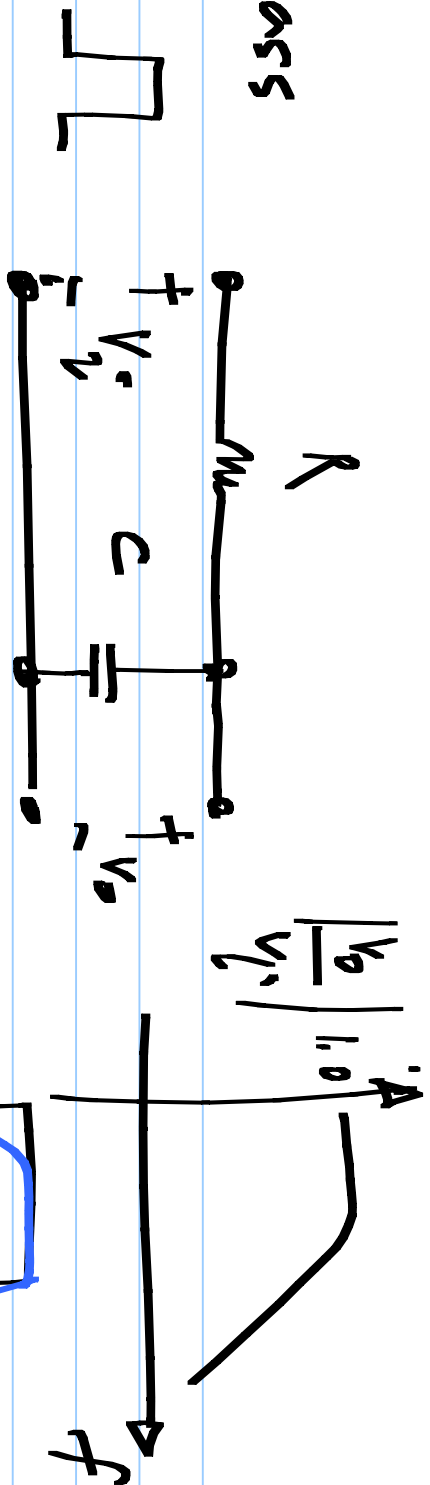
EE 6322

Data transmission through a channel 2/3/2018

PCB, coaxial cable, fiber



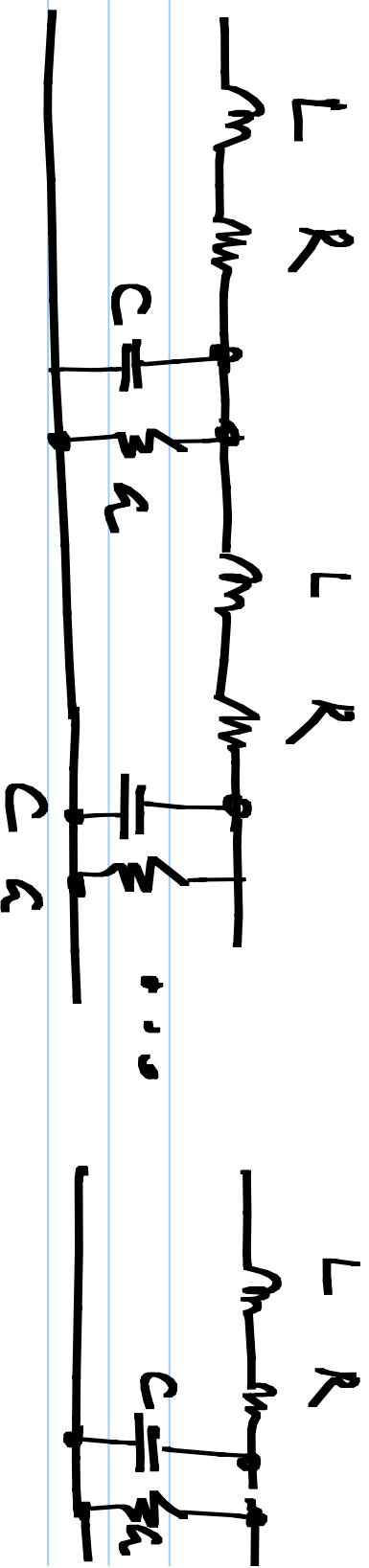
RC low pass



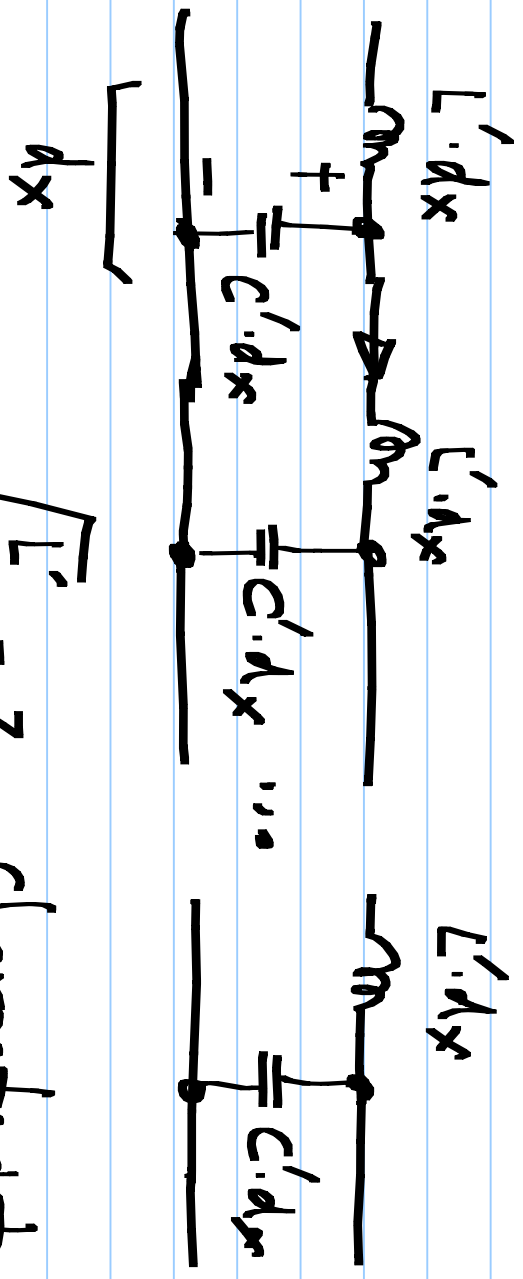
Distributed

Lumped

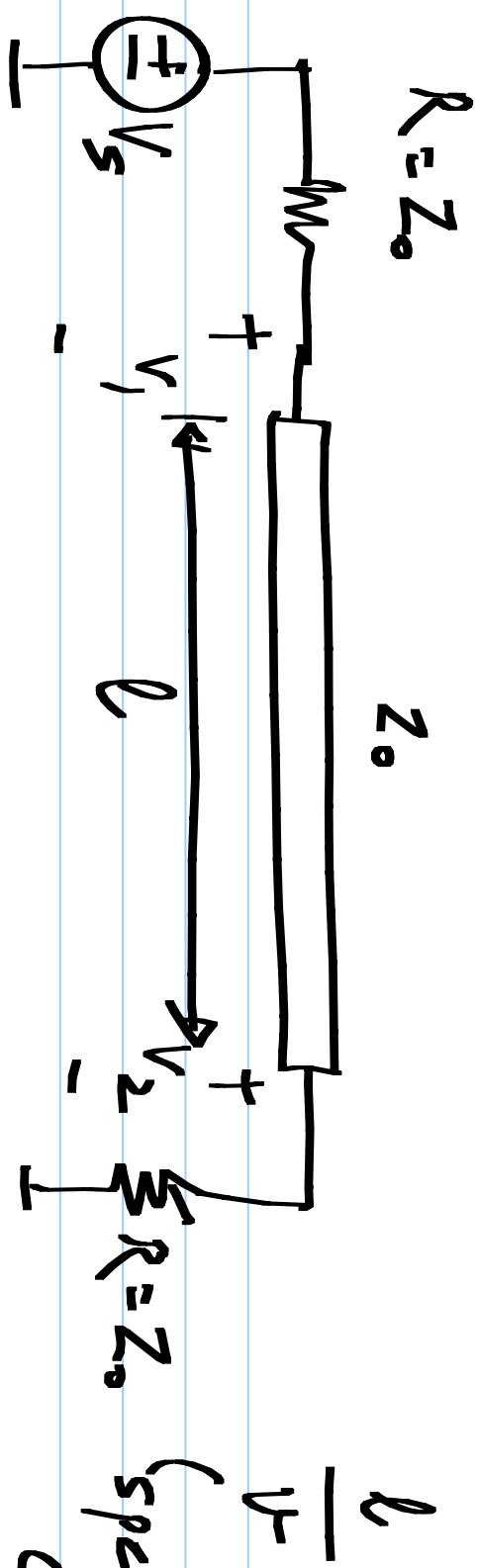
-20



Lossless transmission line L', C' (per unit-length)



$$\sqrt{\frac{L'}{C'}} = Z_0 \text{ characteristic impedance}$$



(speed)

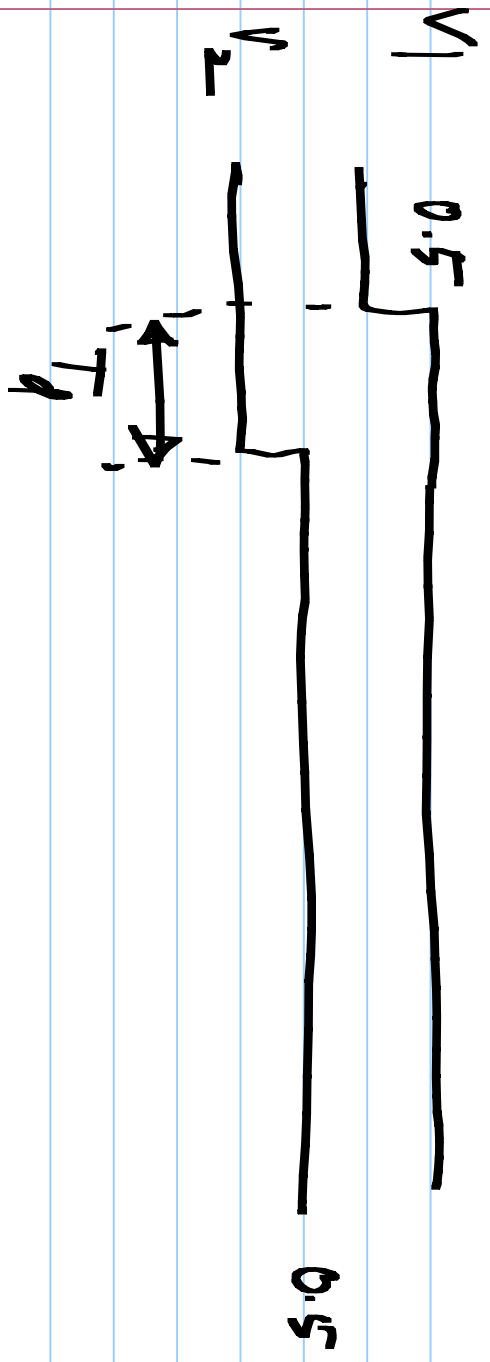
$$\frac{c}{\sqrt{\epsilon \cdot \mu}}$$

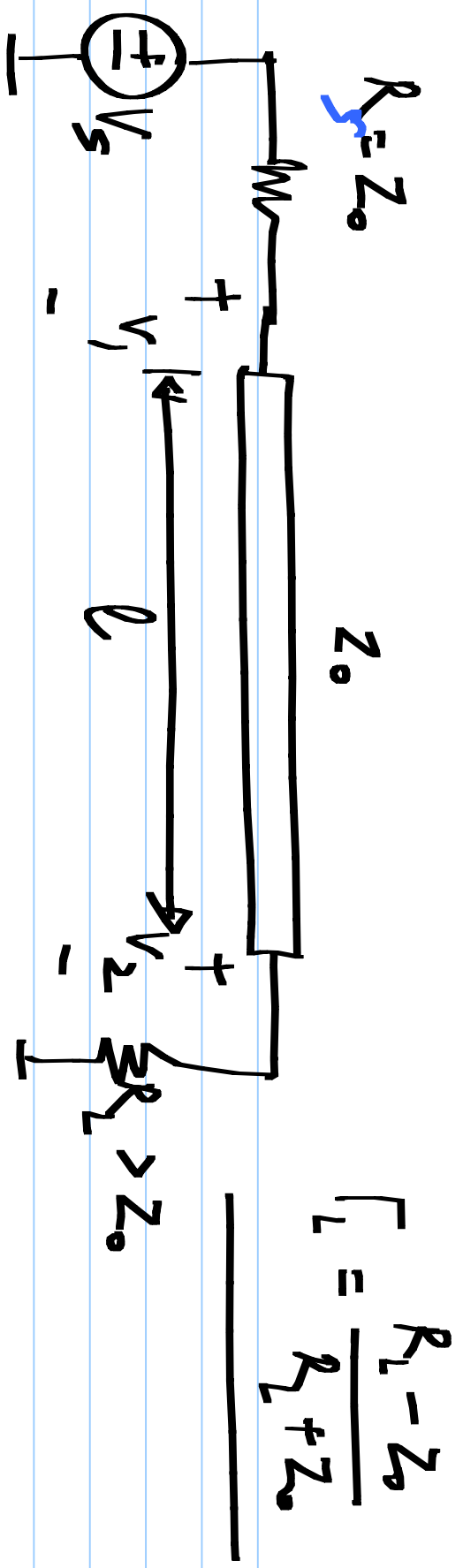
$$\frac{3 \cdot 10^8 \text{ m/s}}{}$$

$$\frac{300 \text{ m}}{\mu\text{s}}$$

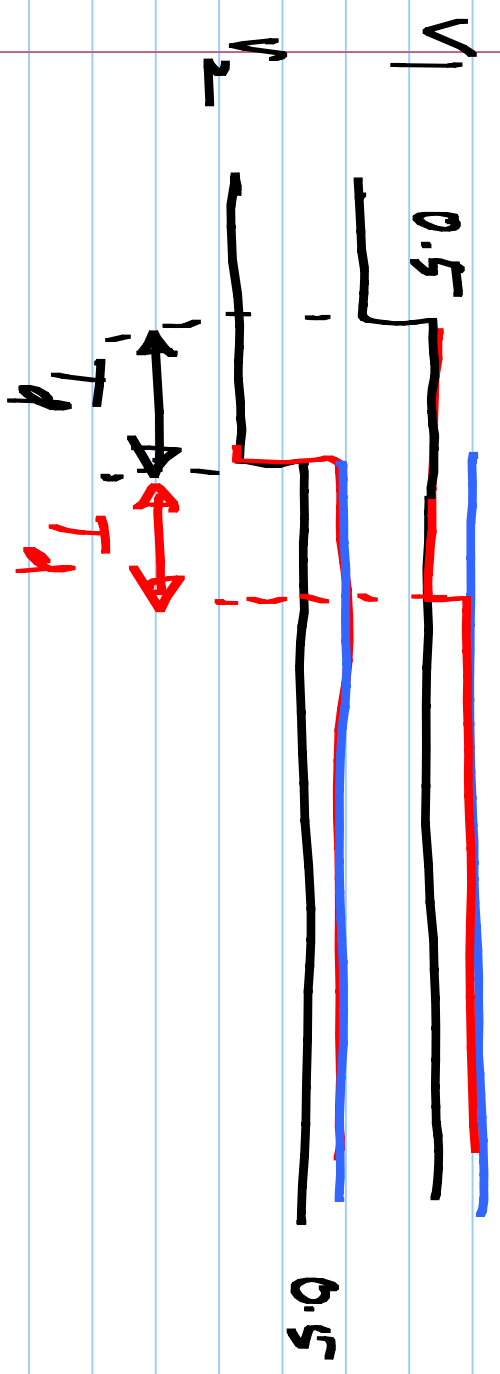
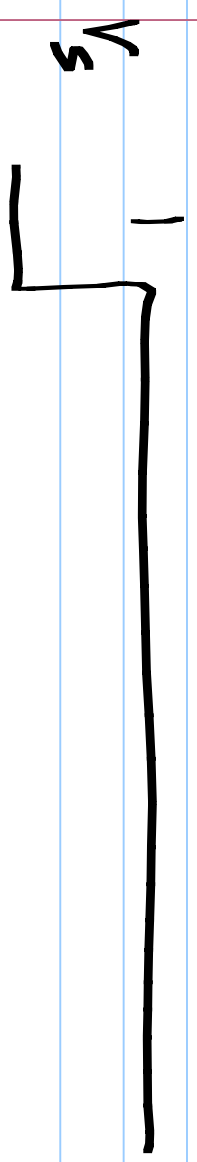
$$300 \text{ mm/ns}$$

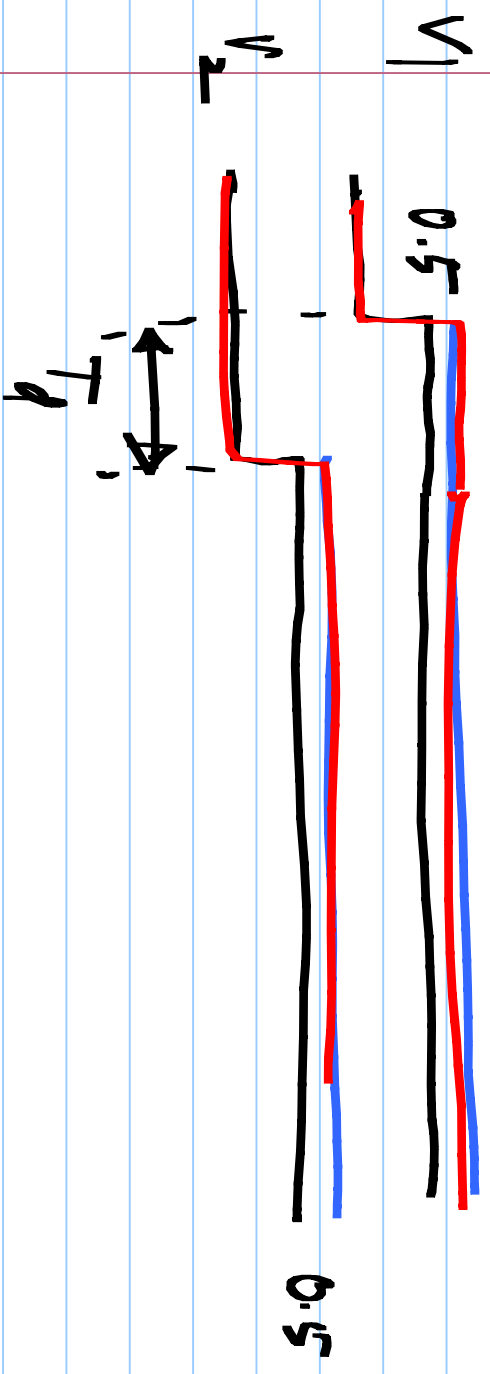
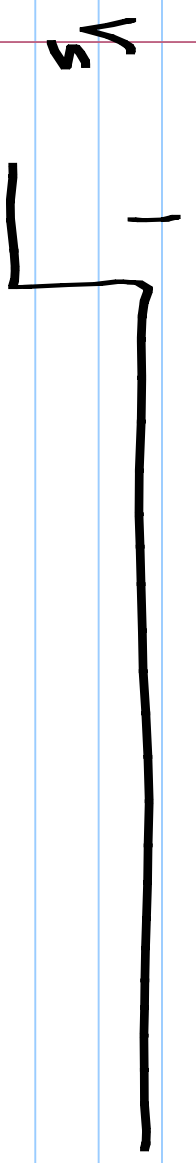
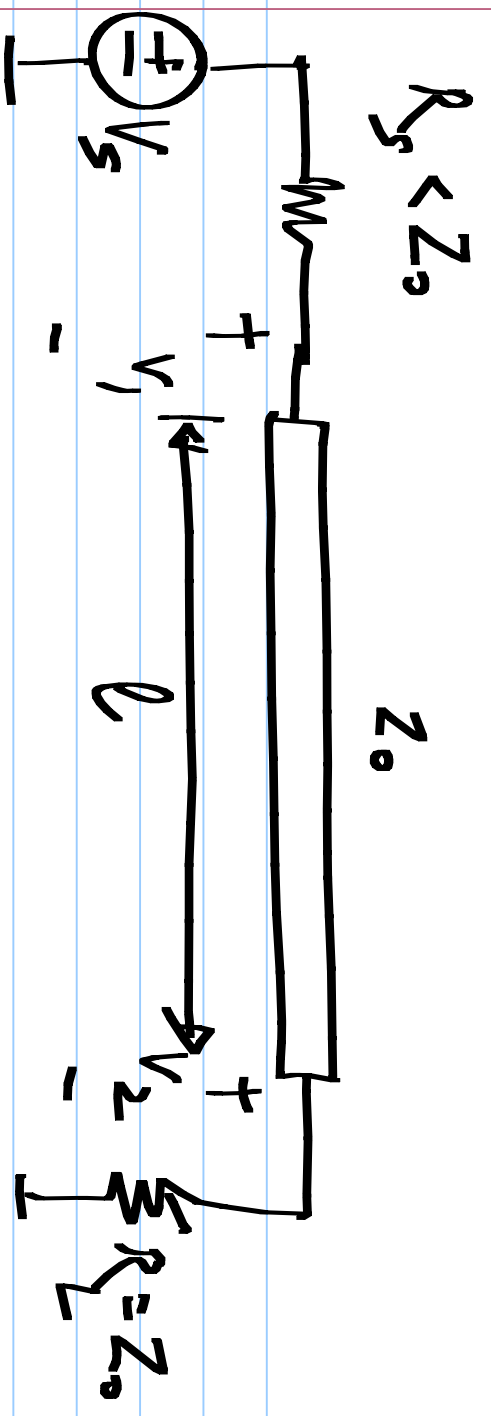
$$300 \mu\text{m/ps}$$





$$\Gamma_L = \frac{R_L - Z_0}{R_L + Z_0}$$

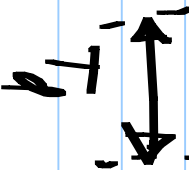
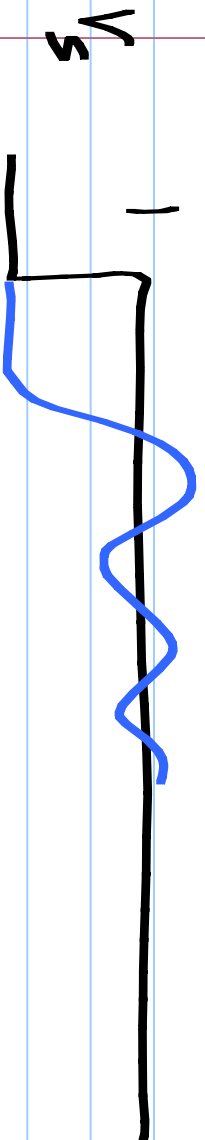
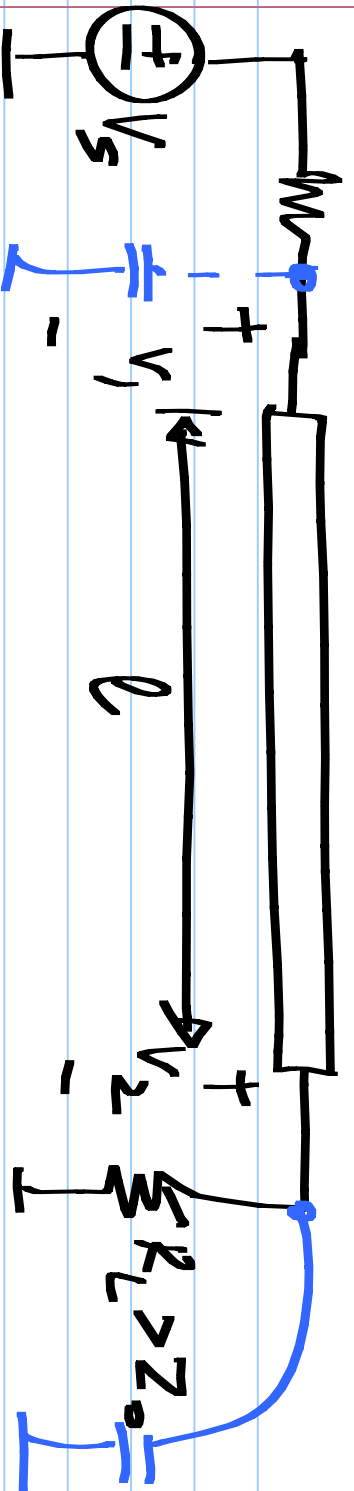




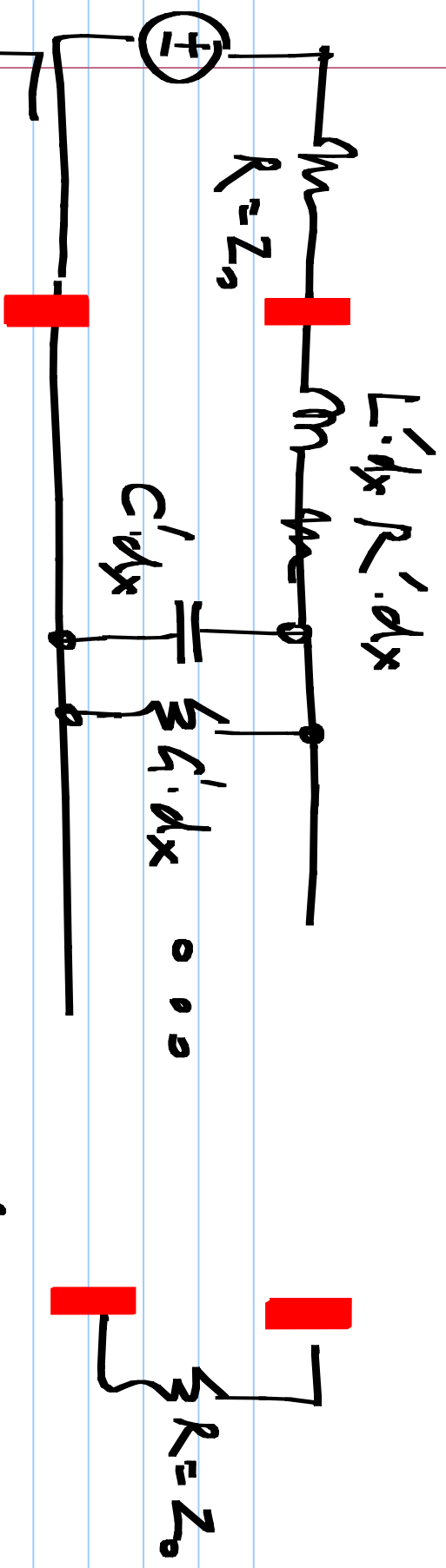
$$R_s > Z_o$$

$$Z_o$$

$$R_s \approx R_L$$



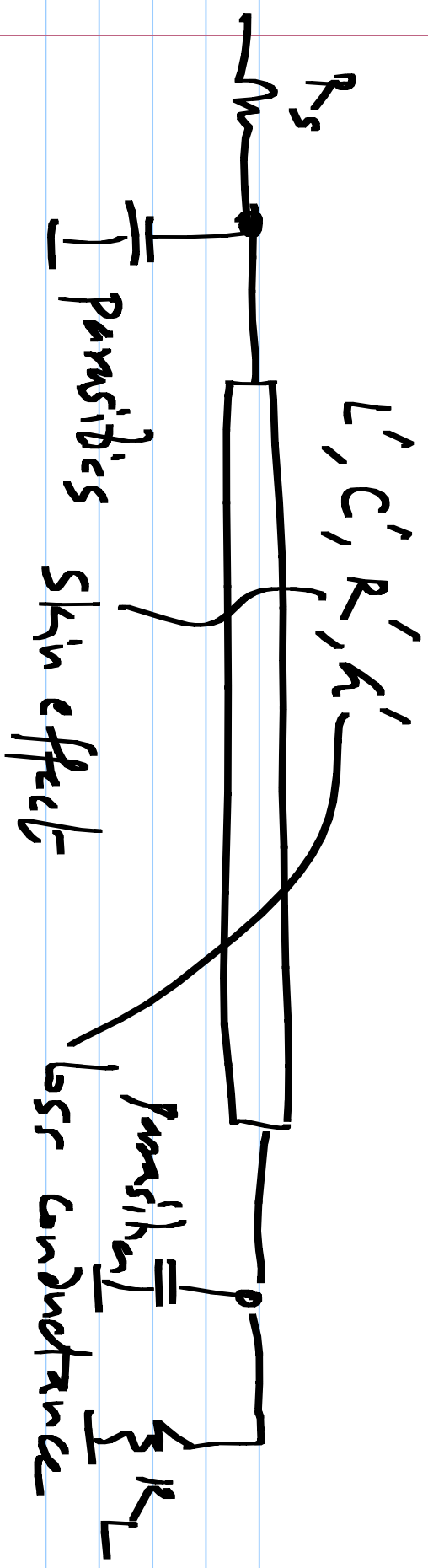
$$0.5$$



$$Z_0 = \sqrt{\frac{R' + j\omega L'}{G' + j\omega C'}}$$

$$\frac{R'}{L'} = \frac{G'}{C'}$$

Distortionless
condition



Z_0 : complex

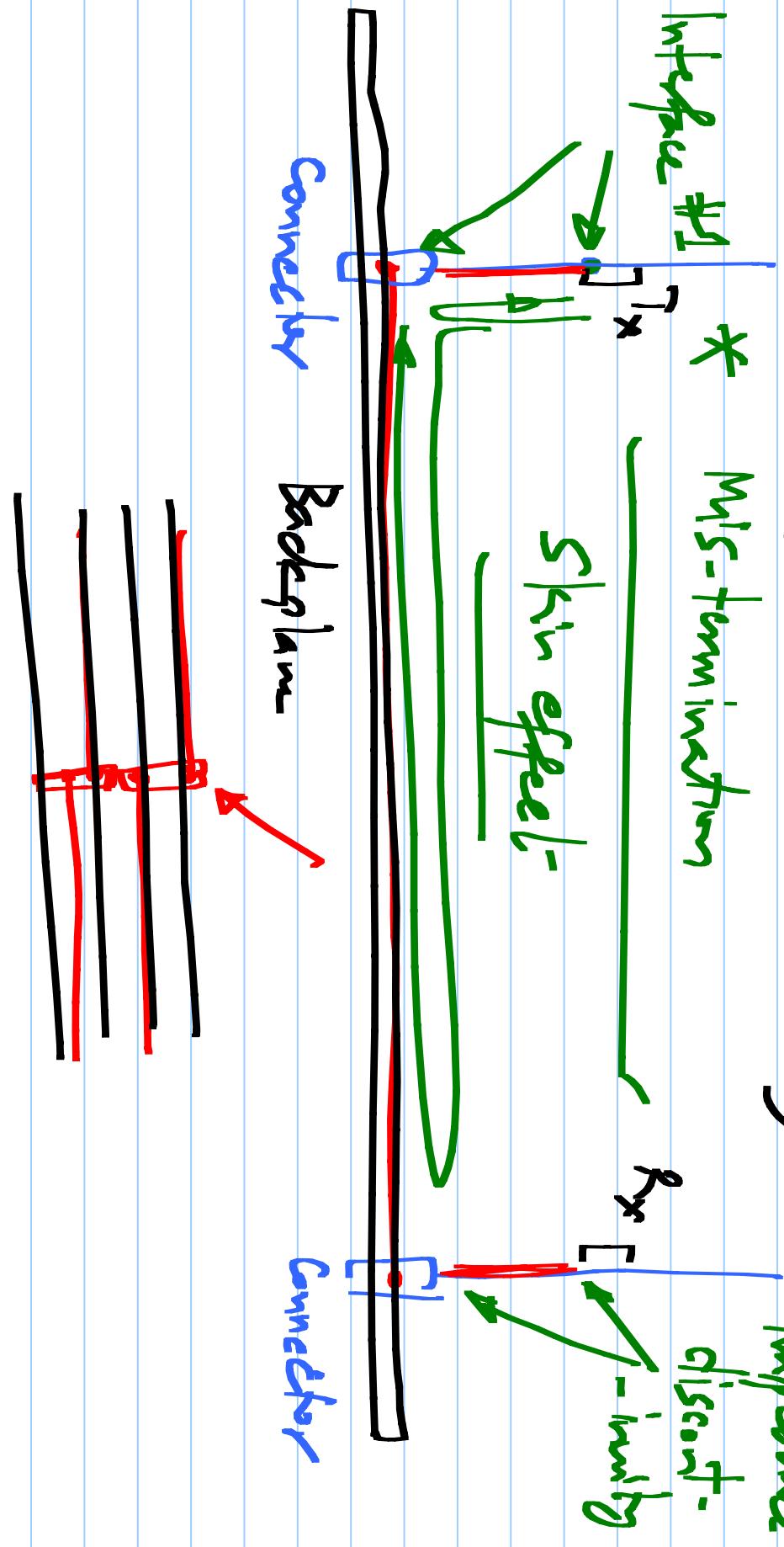
* Termination resistance not equal to Z_0
 , parasitic capacitance

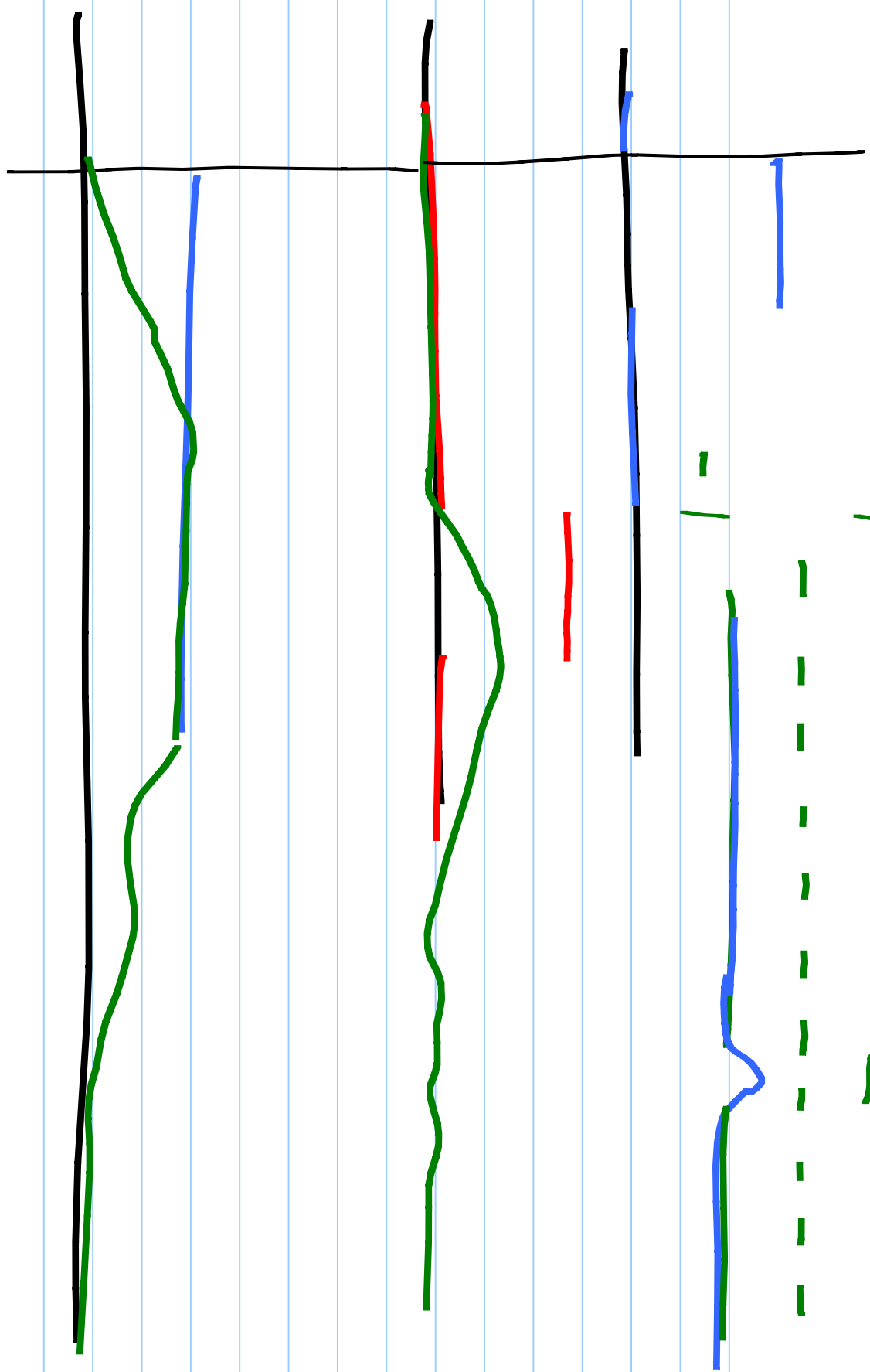
* Transmission line impedance not uniform

* Impedance discontinuity

* MIS-termination

Skin effect:





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