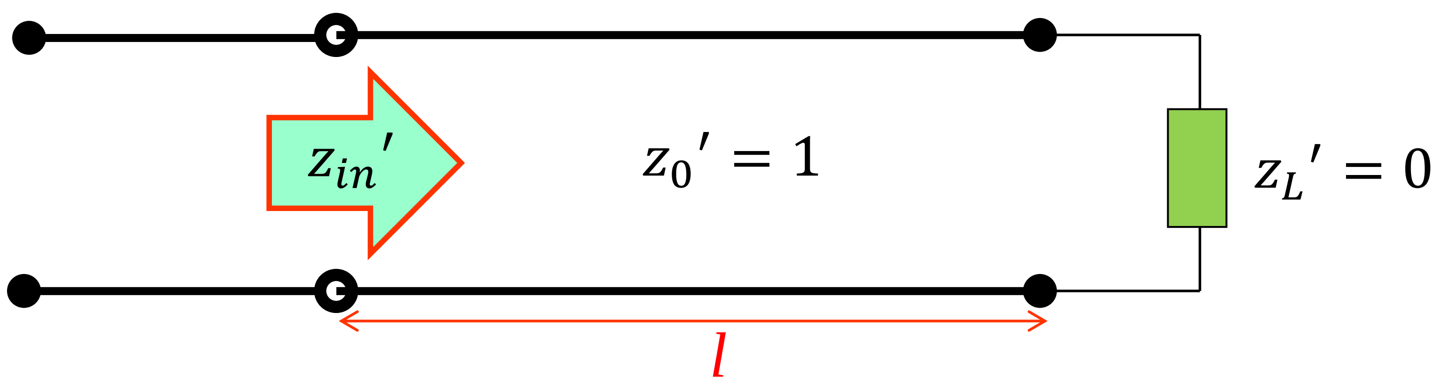
HA # 2

1. Write MATLAB code to determine the input impedance of a transmission line that is terminated in a **short circuit**, and whose length is:

$$a)\ l = {}^{\lambda}/_{8} = 0.125\lambda \qquad \Rightarrow \qquad 2\beta l = 90°$$

$$\text{b)}\ l = {}^{3\lambda}/_{8} = 0.375\lambda \qquad \Rightarrow \qquad 2\beta l = 270°$$



2. A load **terminating** at transmission line has a normalized impedance $z_L{}' = 2.0 + j2.0$. What should the **length** l of transmission line be in order for its input impedance to be:

   a) Purely **real** (i.e., $X_{in} = 0$)

   b) Have a real (resistive) part equal to **one** (i.e., $r_{in} = 1.0$)

   - Write MATLAB code to demonstrate the achieved solutions on Smith Chart.
   - Demonstrate this using ADS Design Guide.

3. A load impedance $\mathrm{Z_L}$ = (20 + j40)Ω is connected to a 50Ω TL of 1cm length and operated at 2 GHz. Use the reflection coefficient concept to find the input impedance $\mathrm{Z_{in}}$ under the assumption that the phase velocity is 100% of the speed of light. Compare the obtained results using Analytical Technique and ADS Design Guide.

4. For an open-circuited 50Ω TL operated at 3GHz and with a phase velocity of 77% of speed of light, find the line lengths to create a 2pF capacitor and 5.3nH inductor. Demonstrate this using ADS Design Guide.

5. Using MATLAB, convert and demonstrate the following normalized input impedance z_{in}' into normalized input admittance y_{in}' on the Z-Smith chart:

$$z_{in}' = 0.5 + j0.5$$

6. Given: $z_{in}' = 1 + j2$

   Use ADS Design Guide to demonstrate the normalized admittance $\lambda/8$ away from the load