Clicker lecture 2 of Topic 2: Smith chart and impedance matching

31 Jan, 2019

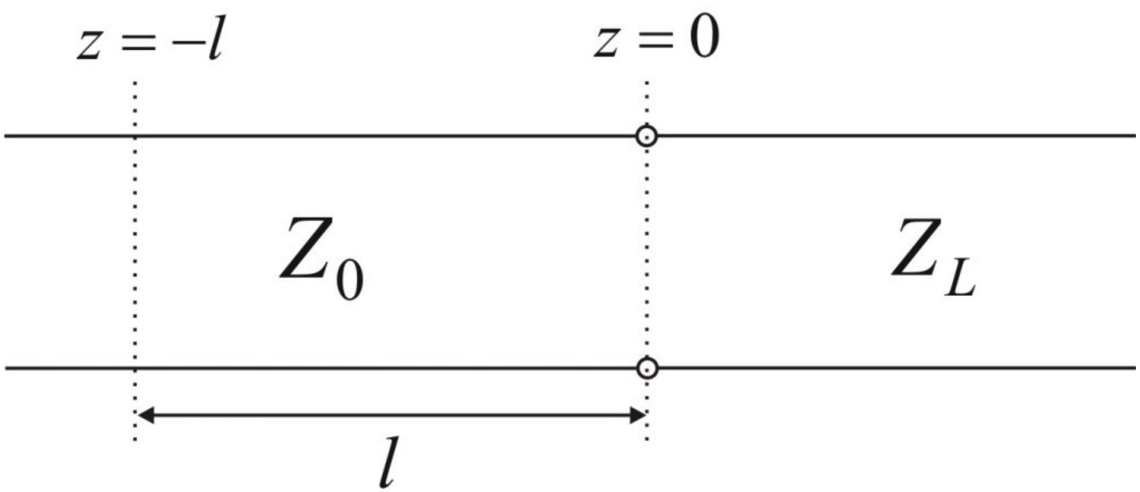
Registration

Go with your mobile phone to

presemo.aalto.fi/mwe1

Fill your full name into the text field for registration.

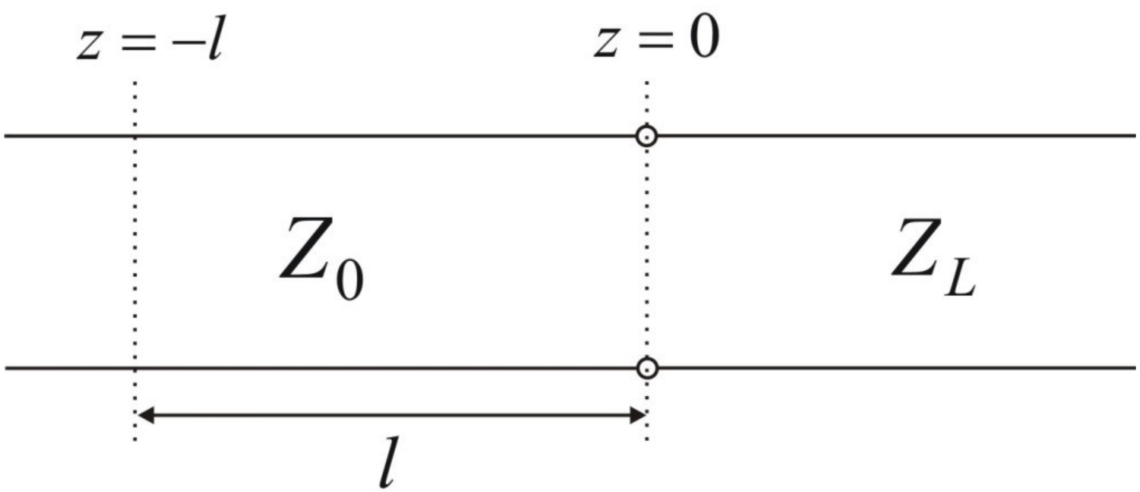
Q1a: The signal propagates to the positive z direction. $Z_o \neq Z_L$. How much (%) of the **power** is transmitted to the line whose impedance is Z_L



$$Z_L = 2.0\ \Omega$$
$$Z_0 = 1.0\ \Omega$$

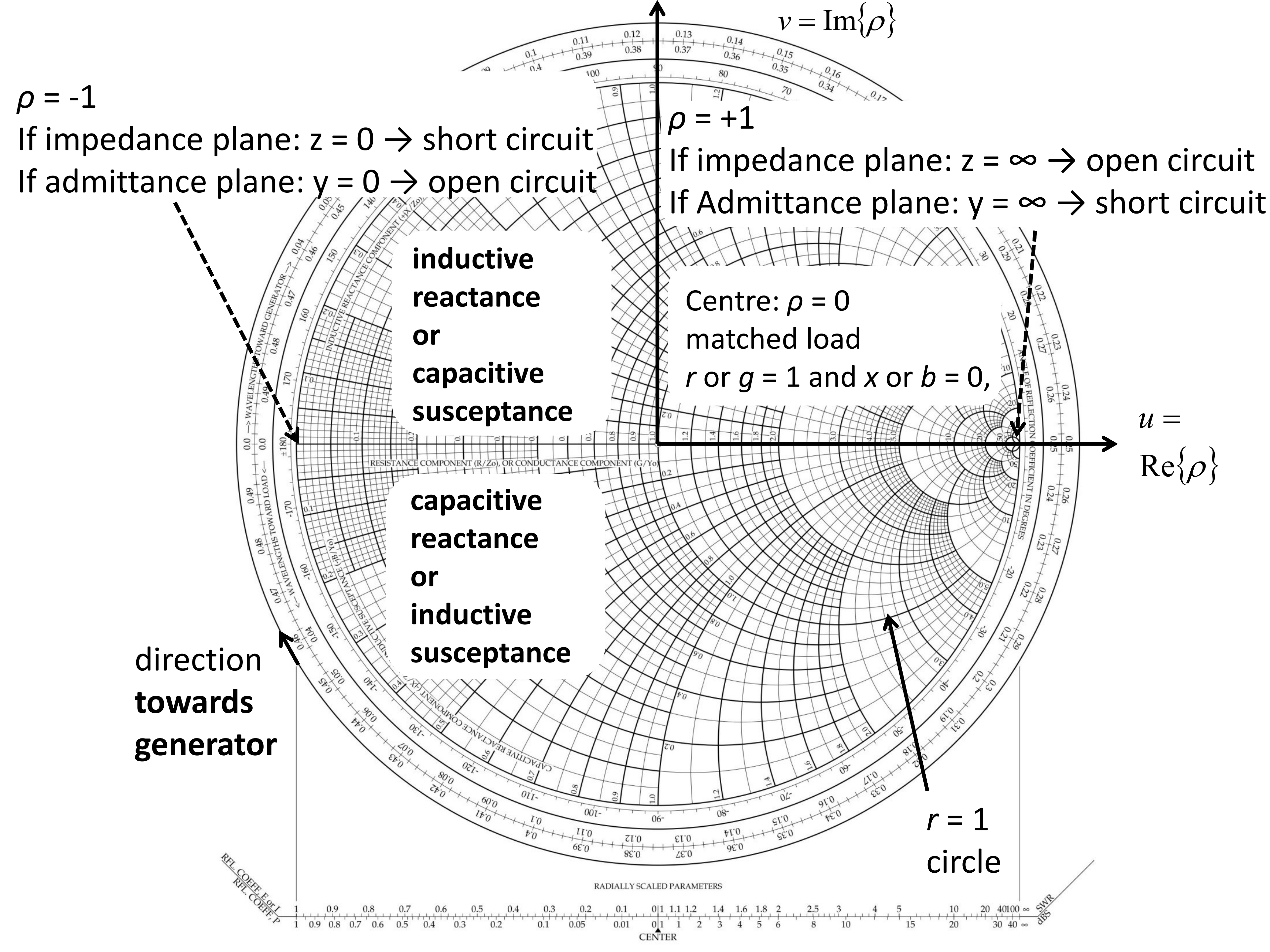
1. 11 %
2. 33%
3. 66%
4. 89%
5. None of above
6. I don't know

Q1b: The signal propagates to the positive z direction. $Z_o \neq Z_L$. How much (%) of the **power** is transmitted to the line whose impedance is Z_L



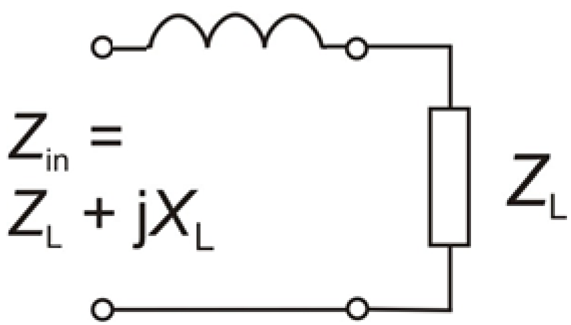
$$Z_L = 2.0\ \Omega$$
$$Z_0 = 1.0\ \Omega$$

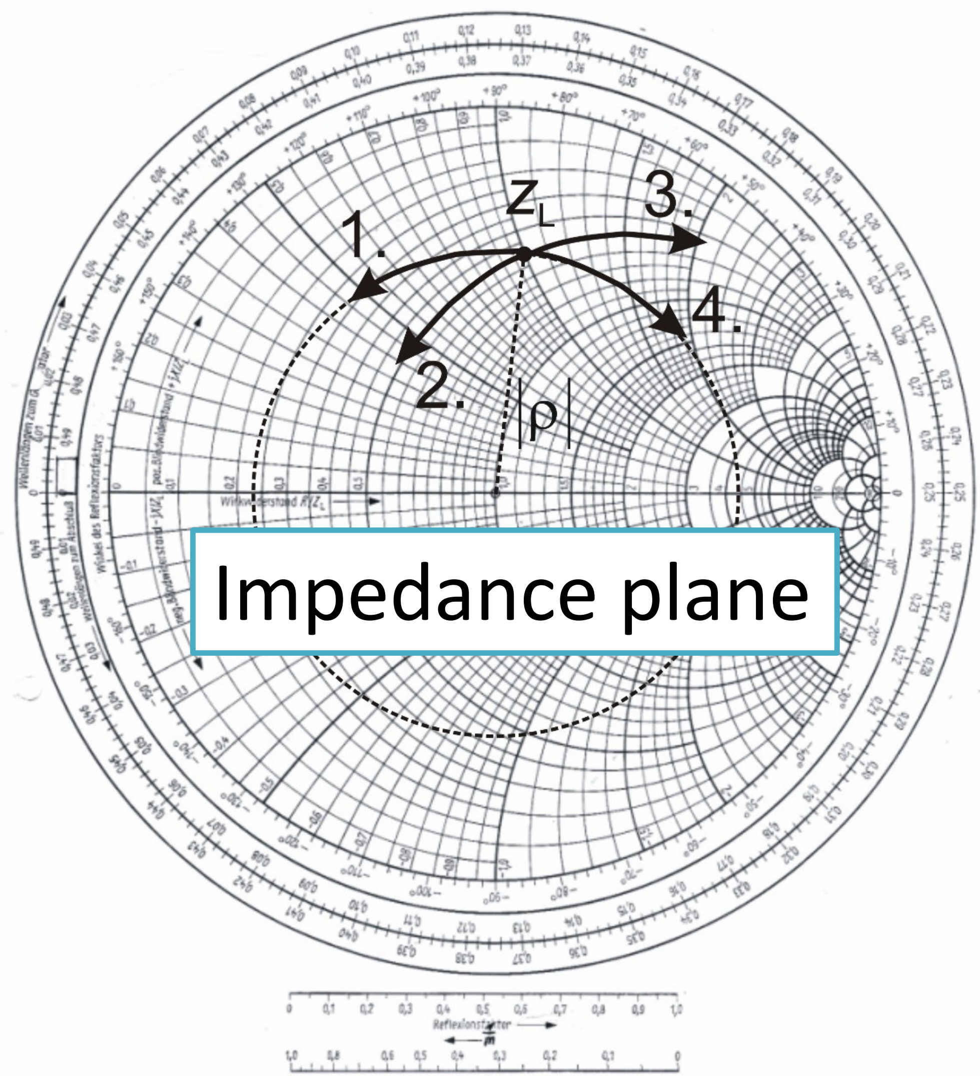
1. 11 %
2. 33%
3. 66%
4. 89%
5. None of above



$v = \mathrm{Im}\{\rho\}$
$u = \mathrm{Re}\{\rho\}$
ρ = -1
If impedance plane: z = 0 → short circuit
If admittance plane: y = 0 → open circuit
ρ = +1
If impedance plane: z = ∞ → open circuit
If Admittance plane: y = ∞ → short circuit
inductive reactance or capacitive susceptance
capacitive reactance or inductive susceptance
Centre: ρ = 0
matched load
r or g = 1 and x or b = 0,
direction **towards generator**
r = 1 circle
RESISTANCE COMPONENT (R/Zo), OR CONDUCTANCE COMPONENT (G/Yo)
INDUCTIVE REACTANCE COMPONENT (+jX/Zo)
CAPACITIVE REACTANCE COMPONENT (-jX/Zo)
ANGLE OF REFLECTION COEFFICIENT IN DEGREES
—> WAVELENGTHS TOWARD GENERATOR —>
<— WAVELENGTHS TOWARD LOAD <—
RADIALLY SCALED PARAMETERS
SWR
dBS
RFL. COEFF, E or I
RFL. COEFF, P
CENTER

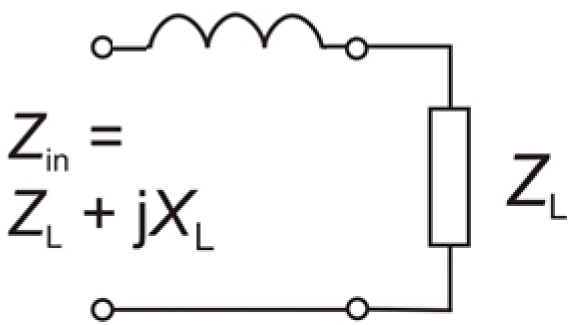
Q2a: Which of the following transitions on the Smith chart (1-5) corresponds to adding **a series inductor** in the **impedance** plane?

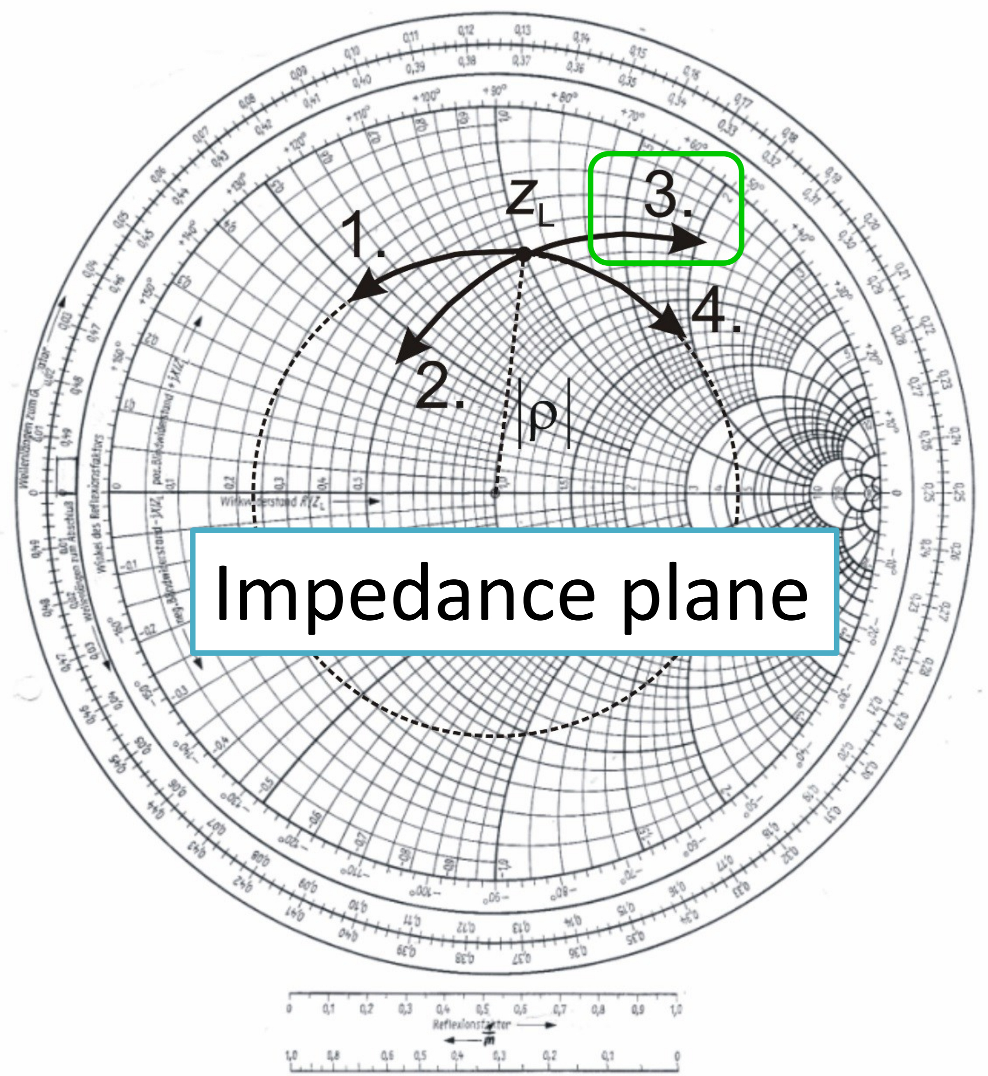




5. None of them
6. I don't know

Q2b: Which of the following transitions on the Smith chart (1-5) corresponds to adding **a series inductor** in the **impedance** plane?

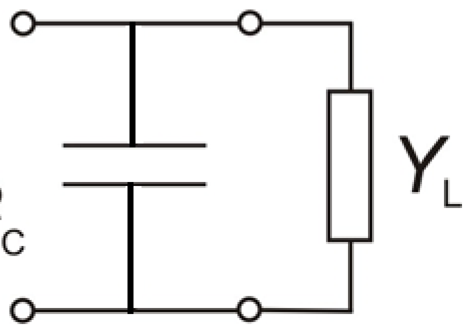


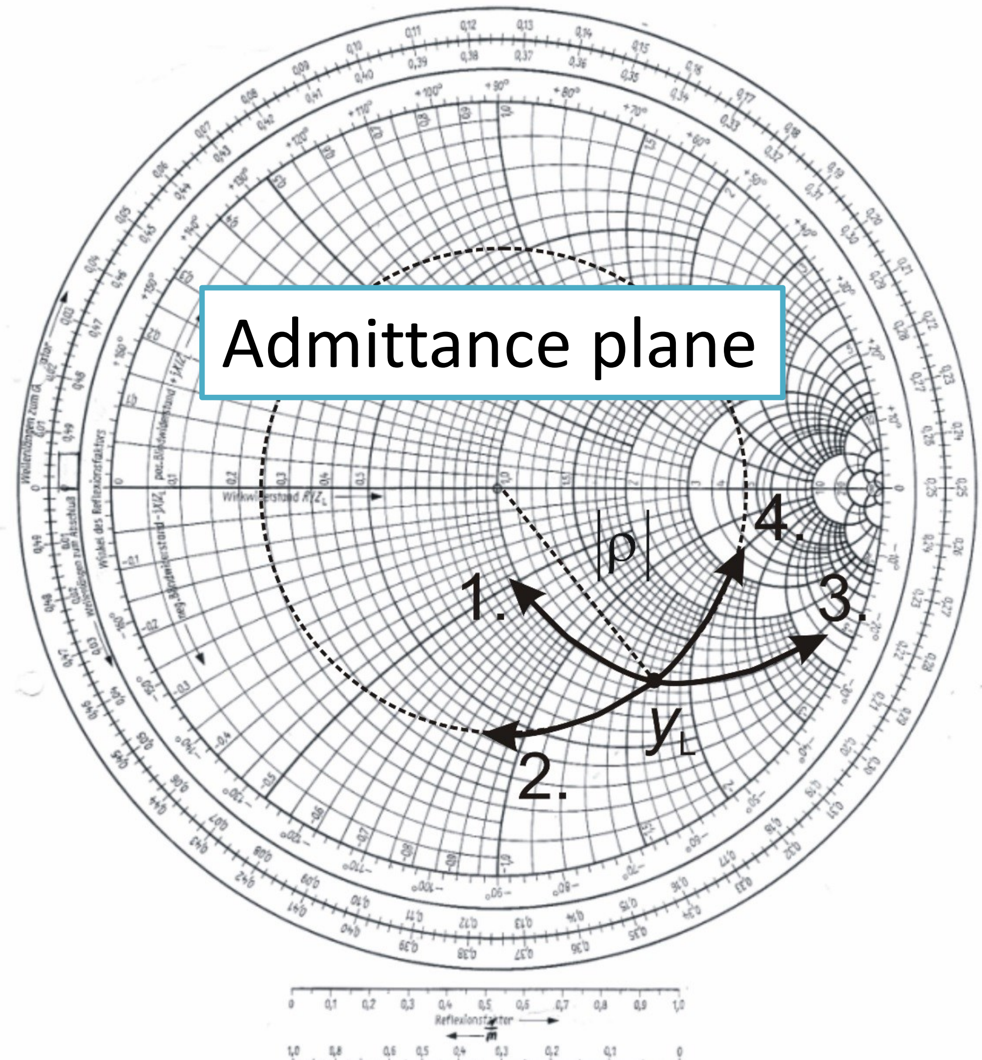


5. None of them

Q3a: Which of the following transitions on the Smith chart (1-5) corresponds to adding **a parallel capacitor** in the **admittance plane**?

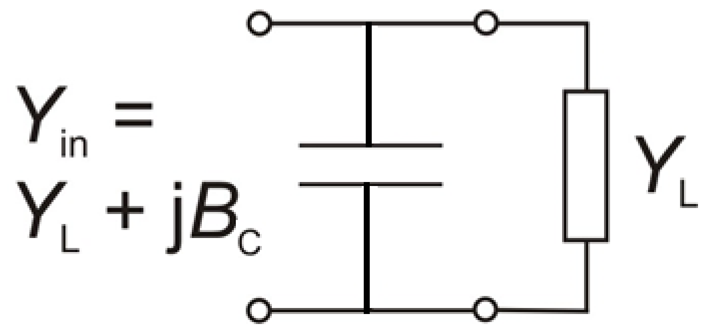
$Y_{in} = Y_L + jB_C$

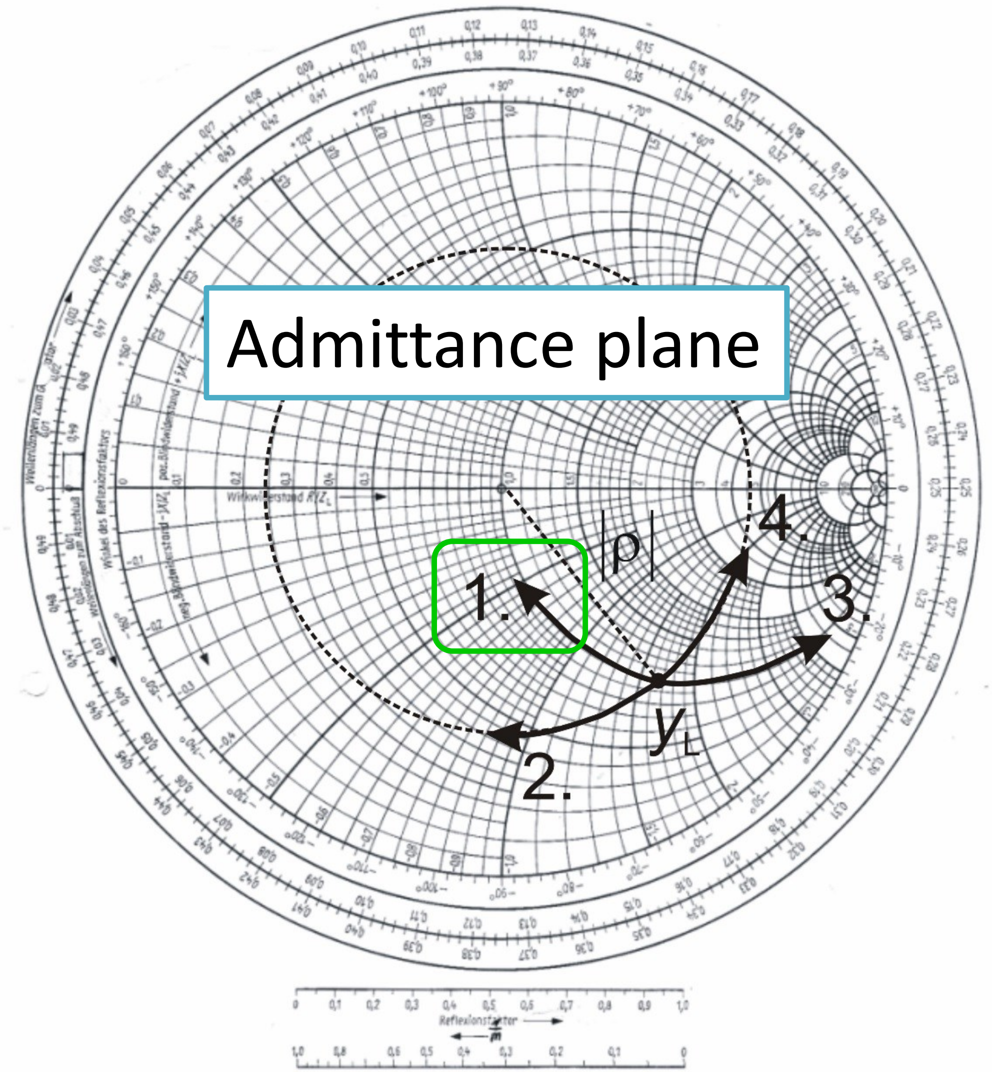




5. None of them
6. I don’t know

Q3b: Which of the following transitions on the Smith chart (1-5) corresponds to adding **a parallel capacitor** in the **admittance plane**?

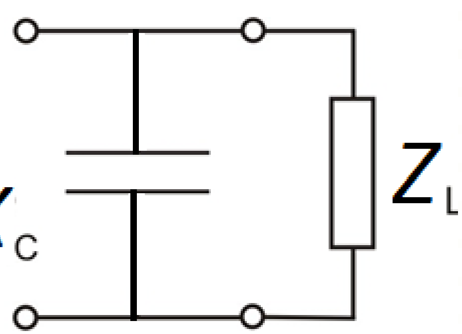


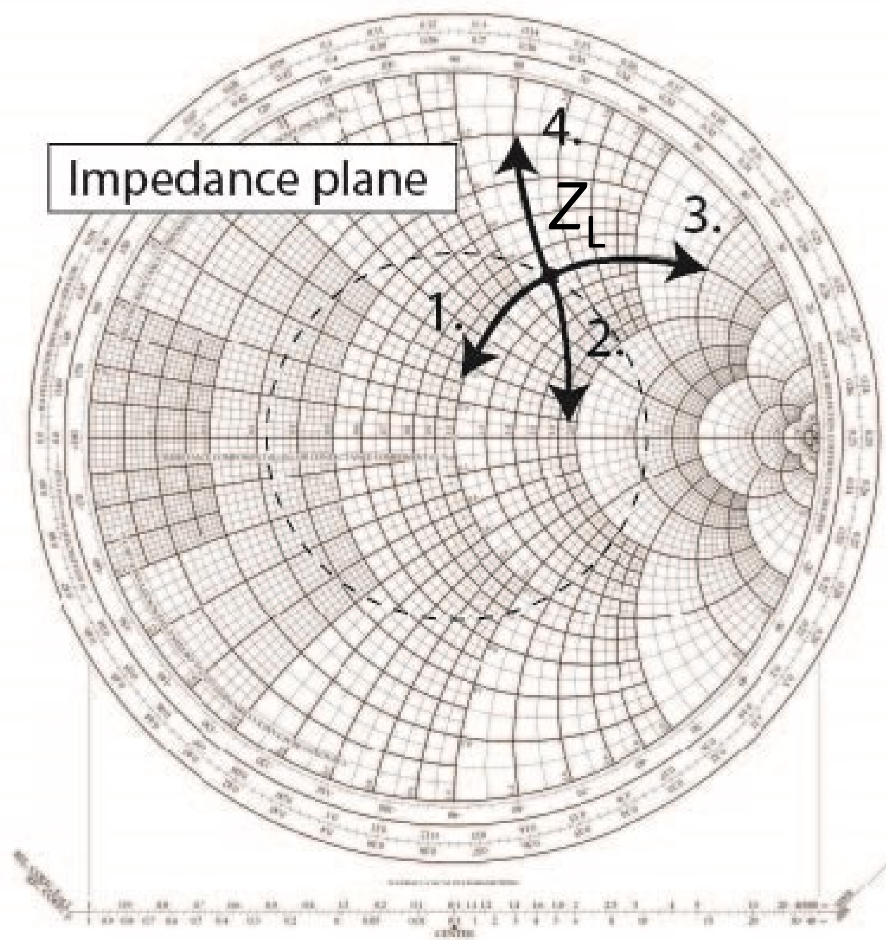


5. None of them

Q4a: Which of the following transitions on the Smith chart (1-4) corresponds to adding **a parallel capacitor** in the **impedance plane**?

$Z_{in} = Z_L + jX_C$

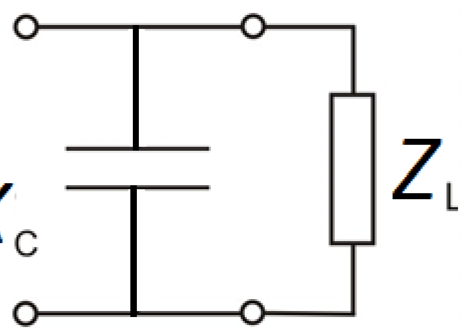


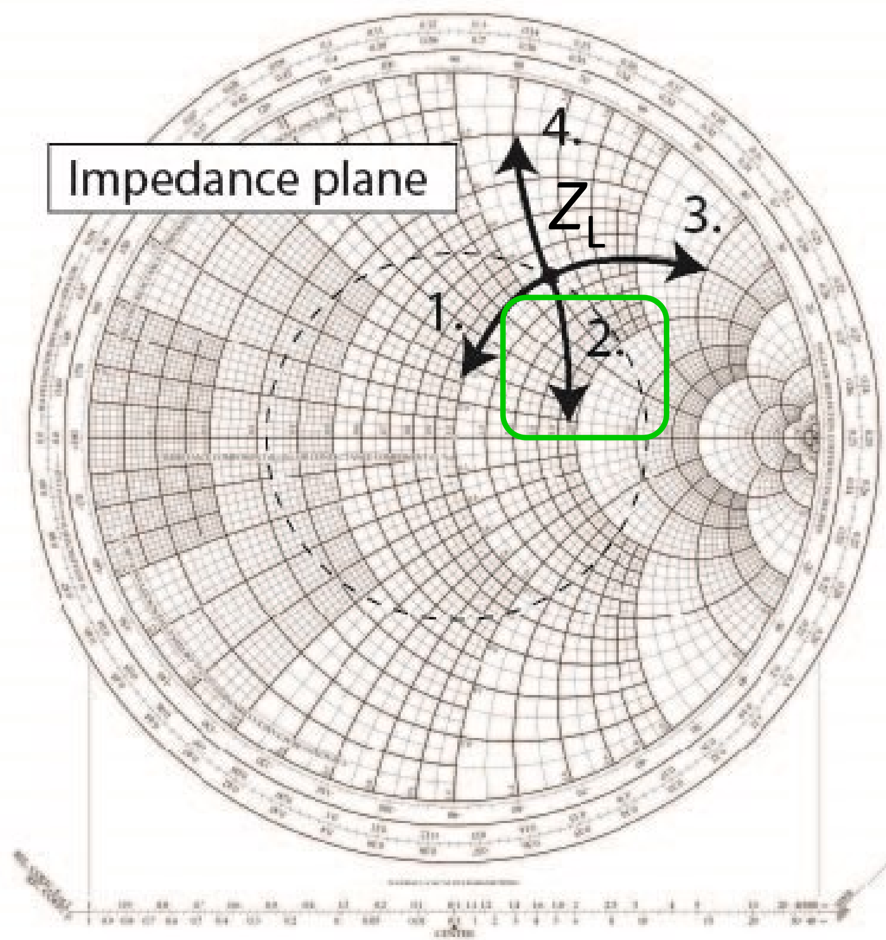


5. None of above
6. I don't know

Q4b: Which of the following transitions on the Smith chart (1-4) corresponds to adding **a parallel capacitor in the impedance plane**?

$$Z_{in} = Z_L + jX_C$$

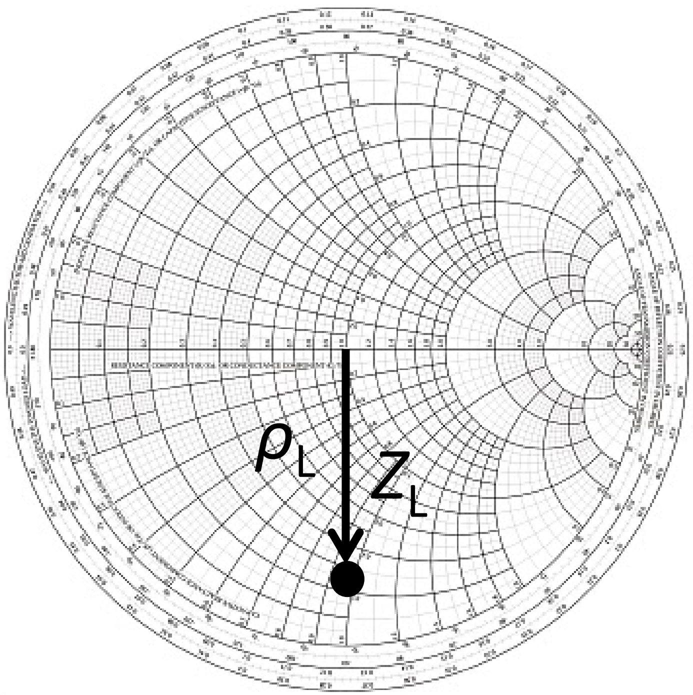


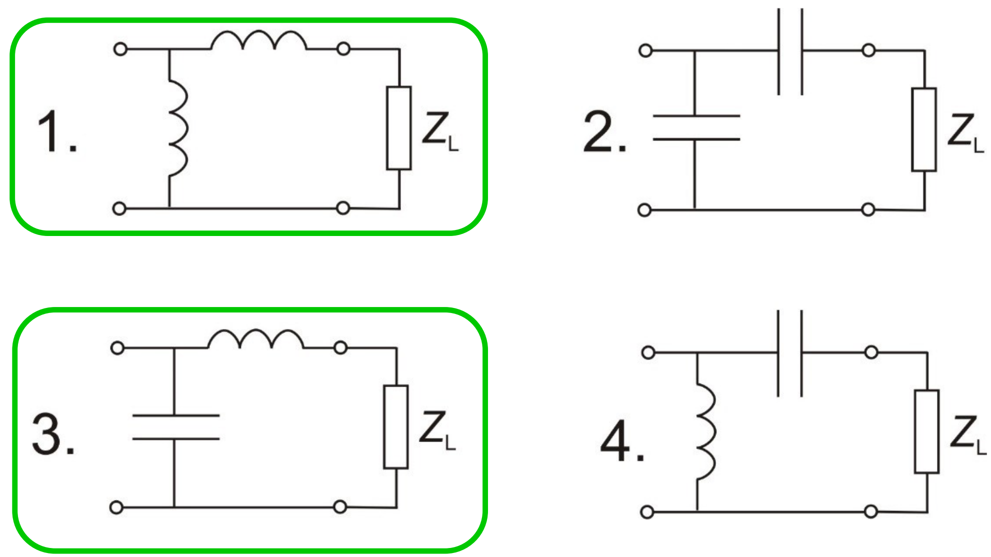


5. None of above

Q5: Which of the following lumped element L-section matching circuits (1-4) is/are **suitable** for matching Z_L?

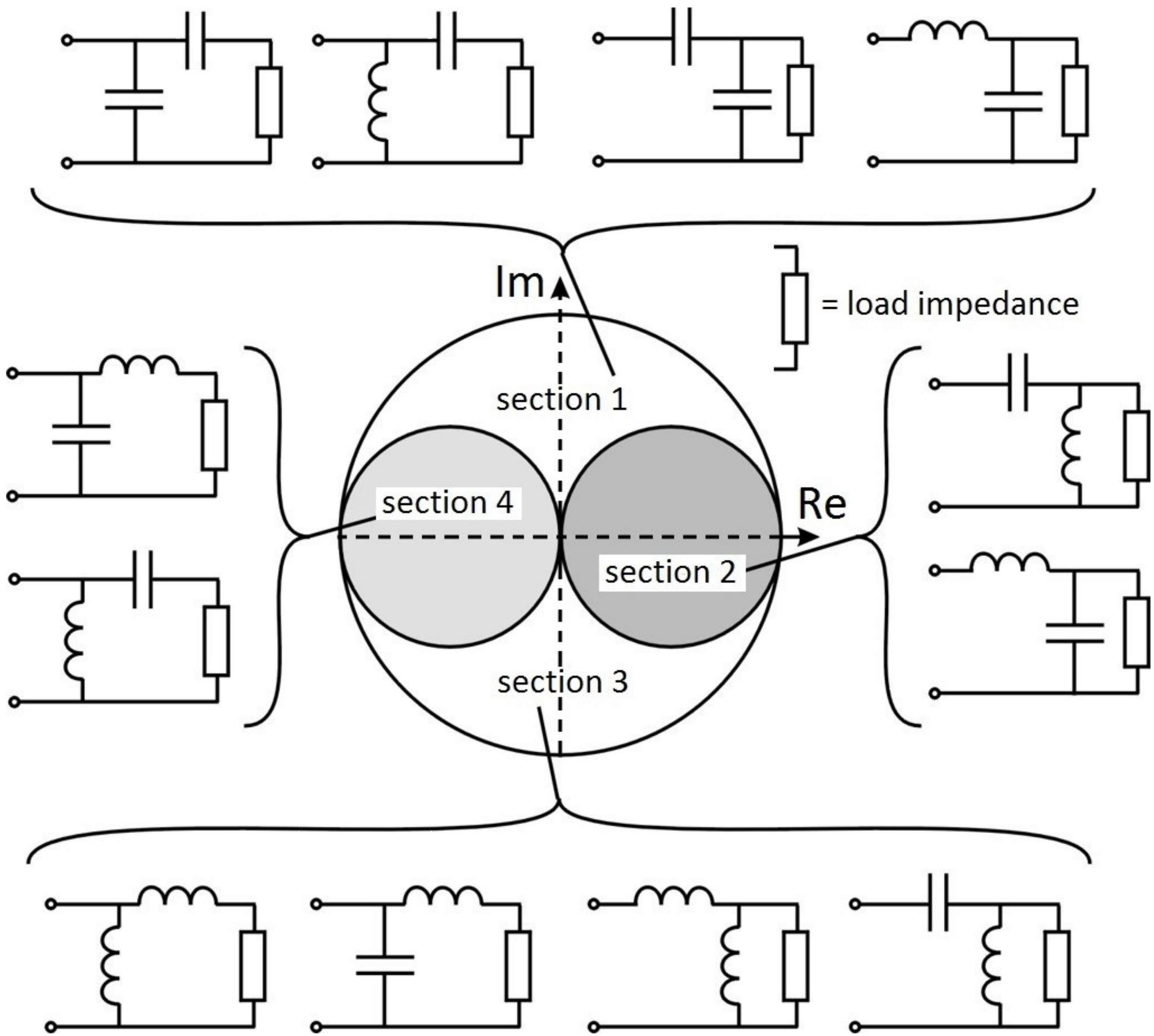
Choose one or more.





5. None of them
6. I don’t know

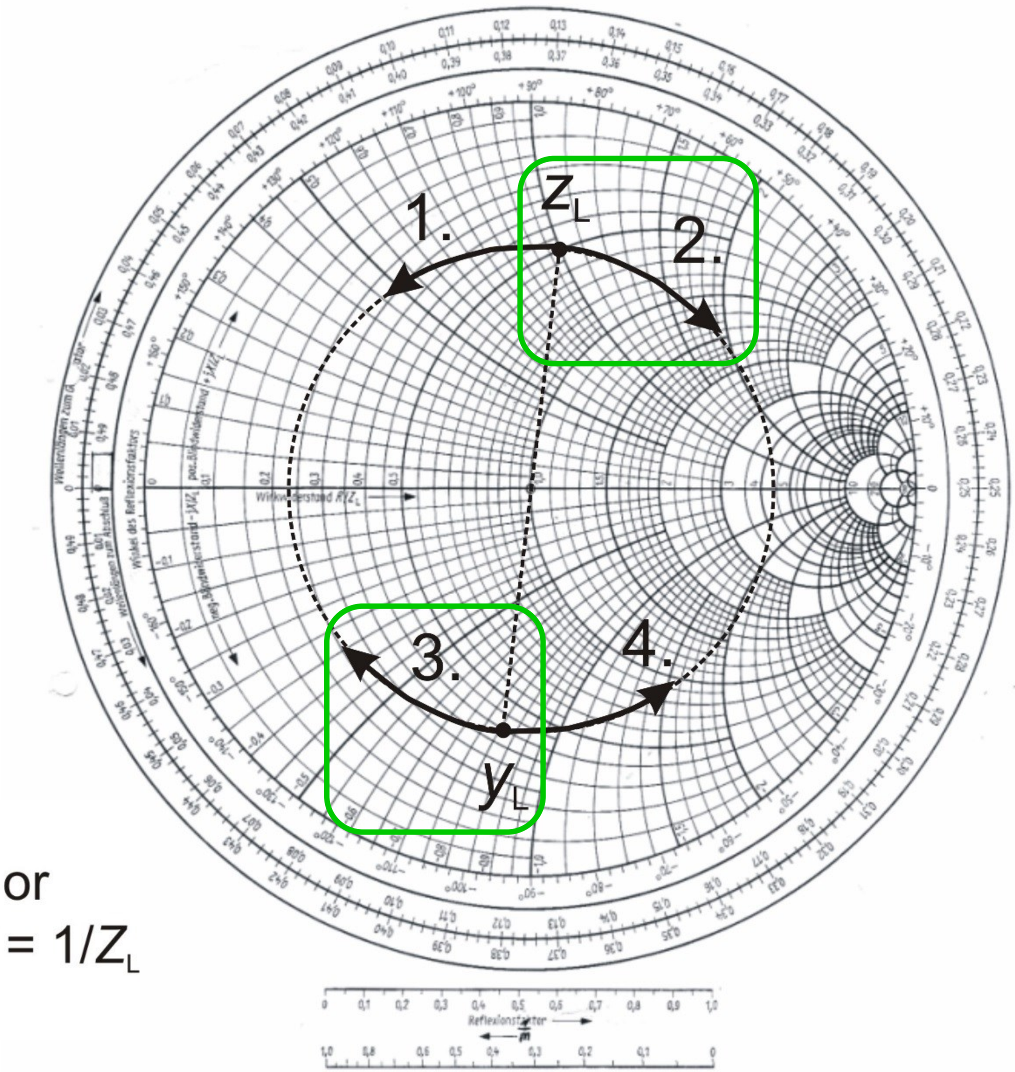
Lumped-element L-section matching circuit topologies

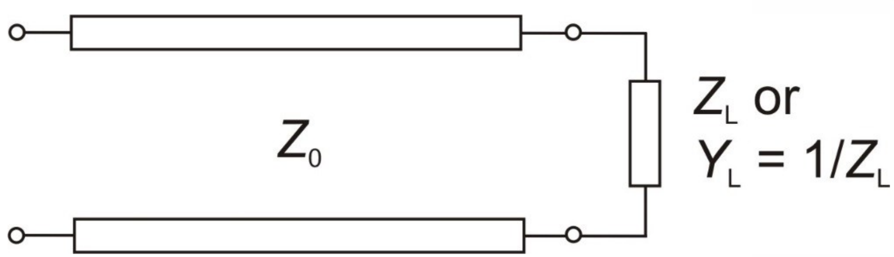


Q6: Which of the following transitions on the Smith chart (1-4) can correspond to adding **a transmission line**?

Choose one or more.

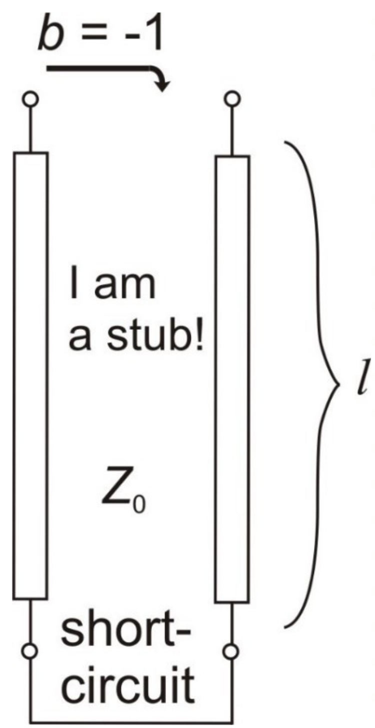
5. None of them
6. I don't know

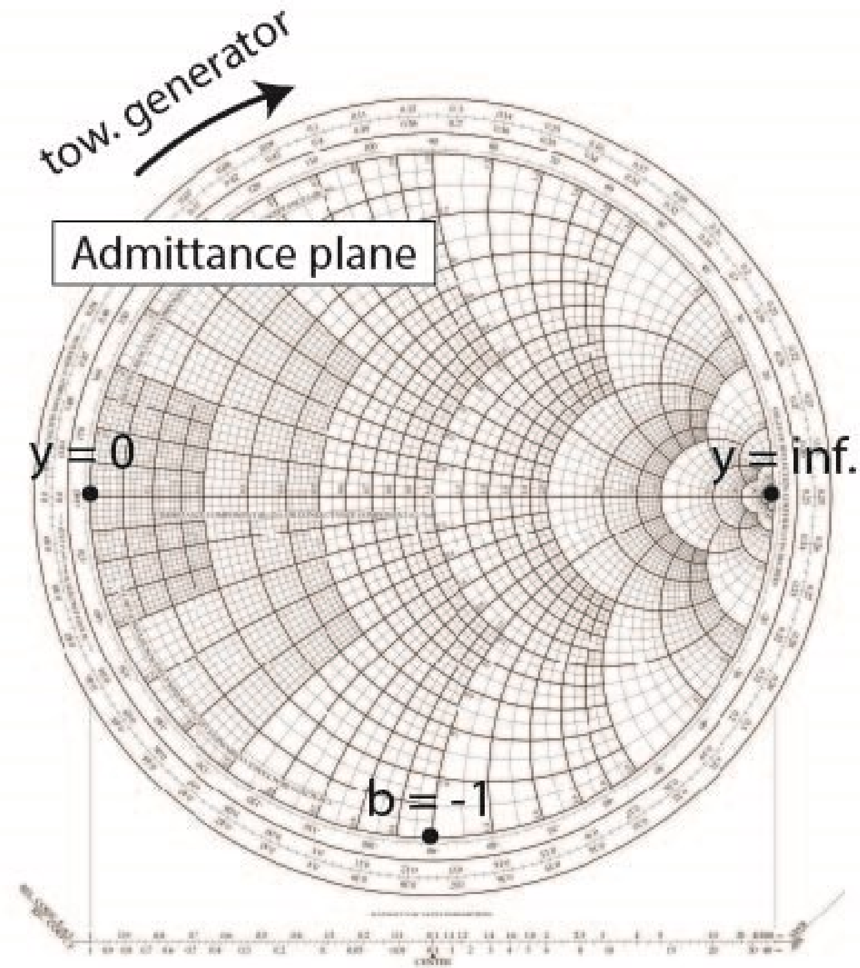




Q7a: The normalised admittance of a **short-circuited** stub is ***y* = j*b* = -j** (seen from the input) . What is the length of the stub in λ?

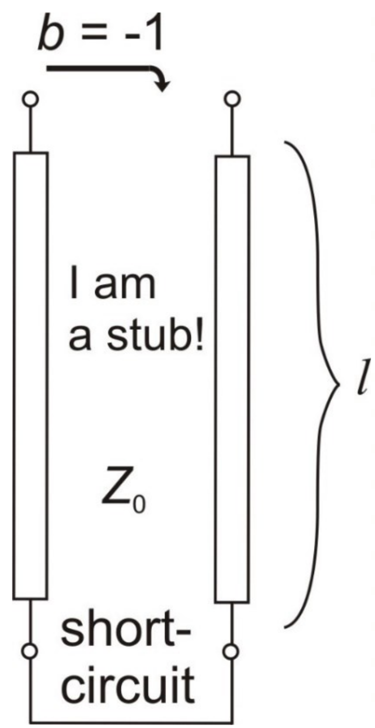
1. 0.0624 λ
2. 0.125 λ
3. 0.25 λ
4. 0.375 λ
5. 0.50 λ
6. I dont' know

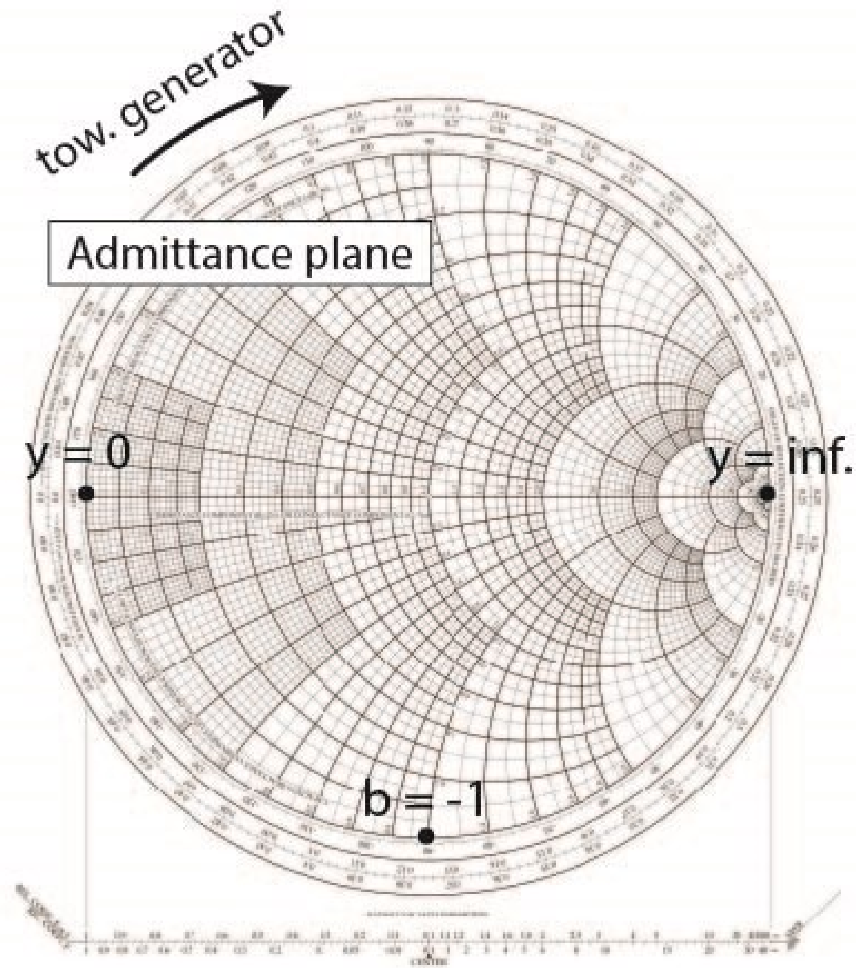




Q7b: The normalised admittance of a **short-circuited** stub is ***y* = j*b* = -j** (seen from the input) . What is the length of the stub in λ?

1. 0.0624 λ
2. 0.125 λ
3. 0.25 λ
4. 0.375 λ
5. 0.50 λ



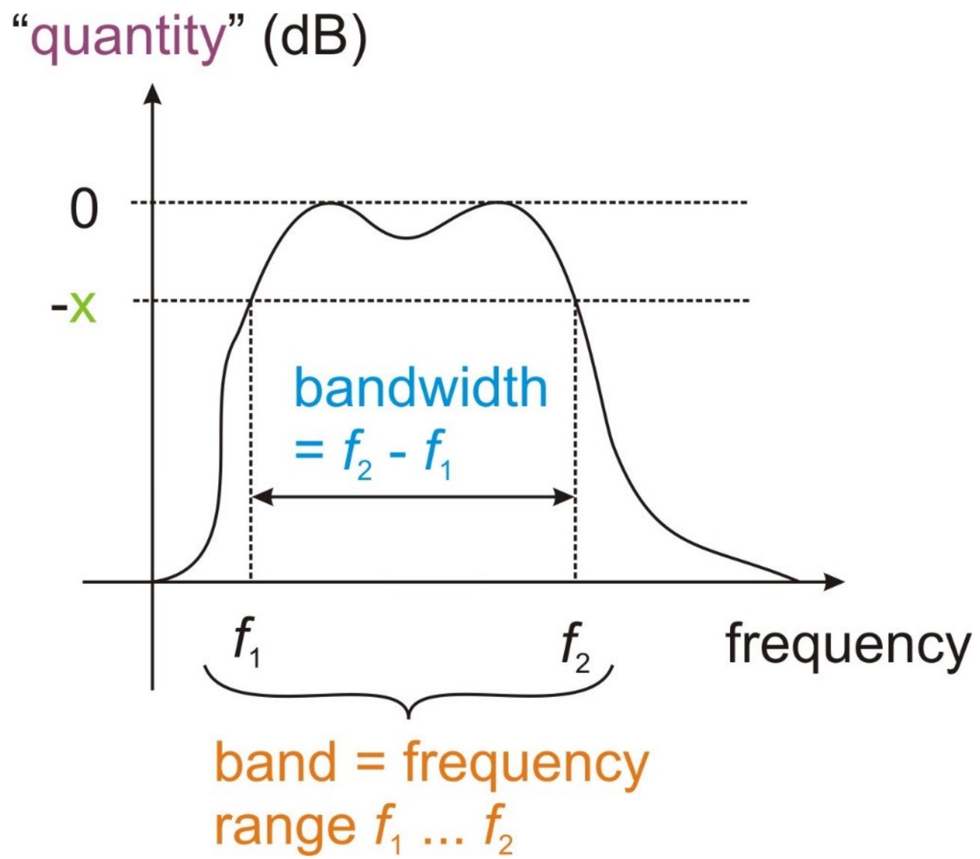


Frequency response

Read: *"Quantity" (in dB) is presented as a function of frequency.*

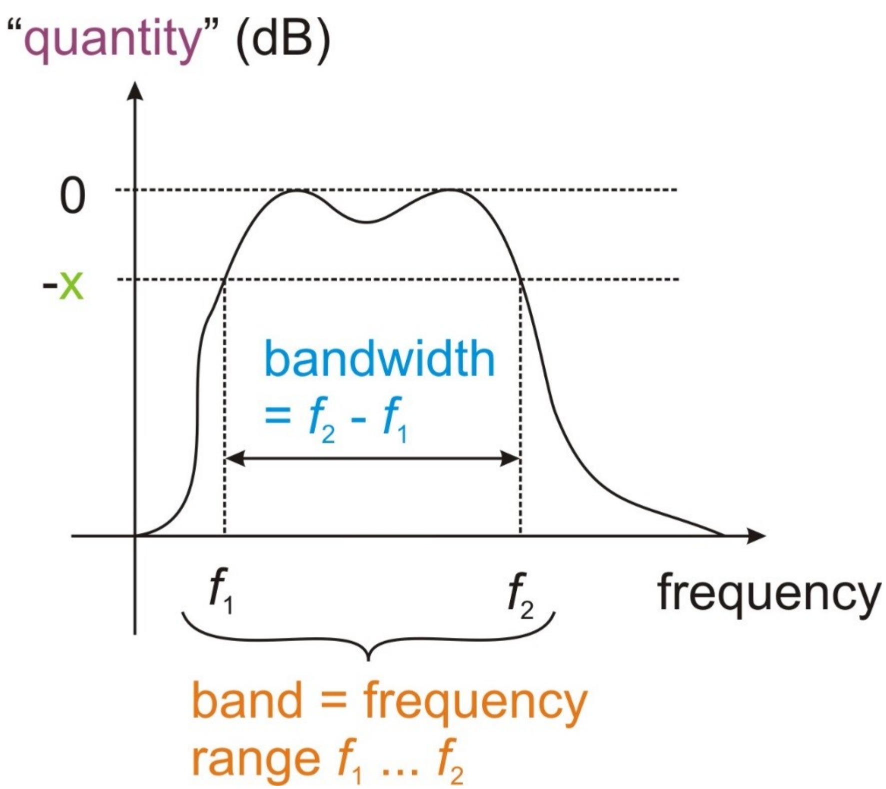
or

Read: *The frequency response of "quantity" in the decibel scale*



Band or Bandwidth?

- **Band** is a range of frequencies, for instance, **2.4 … 2.5** GHz
- The corresponding **bandwidth** (= the width of the band): **100 MHz** (= **2.5 – 2.4** GHz)



”Quantity” (-)x-dB bandwidth

For instance,
amplifier **gain** (-)**3**-dB **bandwidth**

Means the width of the frequency range where the attenuation of the gain is **less than** 3 dB.

Also called ”half-power bandwidth”.