Exercise #1 : Analytical calculations versus Smith chart (tutorial_n1_Smith_chart.pptx)

An air line, with a characteristic impedance of $Z_C = 250\ \Omega$, is powered at the frequency $f_0 = 500$ MHz.

It is 2m long and ends at an impedance Z_L . The SWR along the line is s = 5 and the first maximum voltage is at d = 12 cm from the load.

• Calculate $|\rho_L|$, ρ_L module and argument of the reflection coefficient on the load.

• Calculate Z_L.

• The input voltage is 10V. What is the value of the voltage at the load terminals. Give V_{max} and V_{min} on the line.

Exercise #2 : Graphical calculations on Smith chart (tutorial_#2_Smith_chart)

An air line, with a characteristic impedance of $Z_C = 20\ \Omega$, is loaded at its end on an impedance $Z_L = R_L + j\ X_L = (24 + j\ 36\ )\ \Omega$. At the frequency of $f_0 = 3$ GHz, the length of the line is $\ell = \lambda_0 /4$.

1) Give, using the Smith chart:
   - The reflection coefficient $\underline{\rho}_L$, the SWR s_L on the load Z_L.
   - The reflection coefficient $\underline{\rho}_{in}$, the SWR s_{in} and the impedance Z_{in} at the distance ℓ, for $f_0 = 3$ GHz and $f_1 = 4$ GHz

Exercise #2 : Graphical calculations on Smith chart

2) A line of length ℓ_1, with a characteristic impedance $Z_C = 20\ \Omega$, short-circuited at one end, is placed in parallel on the previous load admittance $Y_L = 1 / Z_L$.

Let :

- Y_a the input admittance of this line with ℓ_1 length
- $Y_t = Y_a + Y_L$ the total admittance in x = 0

ℓ_1 is selected to obtain a real Y_t named R_t. Use Smith chart to give ℓ_1 and R_t at f = 3 GHz.