TD 1

(Mathematical Foundations of Complex Numbers)

Exercise 1 :

From the trigonometric form of a complex number, show that every complex number admits another form called the exponential form, which is expressed in terms of its modulus and argument.

Exercise 2 :

By applying Euler's formula, calculate the linear expression of cos^4x, cos^3x, sin^2x.

It is given that: $(a+b)^4 = a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4$

Exercise 3:

Let the complex number $z = 1 - j$.

By applying Moivre's theorem, calculate $(1-j)^{20}$.

Exercise 4:

An alternating sinusoidal voltage is applied:

$$u(t) = 1.3\ sin(\omega t + 0.3)$$

to an electrical impedance:

$$Z = 49.36 - j\ 31.19.$$

1. Write the expression of the impedance in polar form.
2. Give the expression of the current $i(t)$ flowing through this impedance.

Exercise 5:

Consider the circuit shown in the figure.

1. Calculate the equivalent impedance $Z_{eq} = z_1 + z_2$
2. Calculate the current III flowing through the circuit.