Aix–Marseille Université 2018-2019

Mathématiques en anglais 1

THE FUNDAMENTAL THEOREM OF ALGEBRA : AN ELEMENTARY AND DIRECT PROOF

1 Problem

The goal of this lecture is to understand a proof (there are several !) of the fundamental theorem of algebra (in France, aka D'Alembert-Gauss theorem) as given by O. Rio Branco de Oliveira in his paper *The fundamental theorem of algebra : an elementary and direct proof* published in Math. Intelligencer 33, (2011) and given in annex.

2 Theory to revise

1. Polynomials. Polynomial functions.
2. Complex numbers. Roots and square roots of a complex number.
3. De Moivre's and Euler's formulae.

3 Exercises

1. Find (in a book or on the web) the statement of D'Alembert's lemma and Argand's inequality.
2. Show that a complex polynomial function is a continuous map from $\mathbb{R}^2$ to itself.
3. Justify the statement that any continuous function from a closed bounded disc in the plane to the real line has a minimum.
4. Fill in the details of the proof of the FTA by justifying all the remaining claims.