# FF M11 Omnibus Pretium

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## Contents



# 1 Algèbre

## 1.1 Généralités, sommes, nombres complexes

- SURJECTIVE: ∀ y ∈ F, ∃ x ∈ E, $y = f(x)$
- INJECTIVE: ∀ $x_1, x_2$ ∈ E, $x_1 = x_2 \Rightarrow f(x_1) = f(x_2)$
- BIJECTIVE: ∀ y ∈ F, ∃ ! x ∈ E, $y = f(x)$

$$\binom{n}{k} = C_n^p = \frac{n!}{n!(n-p)!} \tag{1}$$

$$\text{Binôme de Newton : } (a+b)^n = \sum_{p=0}^{n} C_n^p \, .a^p.b^{n-p} \tag{2}$$

$$a^n - b^n = (a-b)\sum_{k=0}^{n-1} .a^{n-1-k}.b^k \tag{3}$$

$$\text{Inégalité de Bernouilli : } 1 + (n+1)x \leq (1+x)^n + x \tag{4}$$

$$||x| - |y|| \leq |x \pm y| \leq |x| + |y| \tag{5}$$

$$\text{FF de Moivre : } (e^{i\theta})^n = e^{in\theta} \tag{6}$$

$$\text{FF de Euler : } \begin{cases} cos(\theta) = \dfrac{e^{i\theta} + e^{-i\theta}}{2} \\ sin(\theta) = \dfrac{e^{i\theta} - e^{-i\theta}}{2i} \end{cases} \tag{7}$$

**Théorème 1** (MA Racine carrée nbr complexe)**.**

$$\begin{cases} x^2 - y^2 = x \\ x^2 + y^2 = |z| \quad où z = x + iy \\ 2xy = y \end{cases} \tag{8}$$

**Théorème 2** (Racine n-ième nbr complexe)**.**

$$\omega_k = |z|^{1/n}.e^{i(\dfrac{arg(z)}{n} + \dfrac{2k\pi}{n})} \tag{9}$$

Rq: $\omega^n - z = \prod_{k=0}^{n-1} (\omega - \omega_k)$

$$\begin{cases} \omega_0 + \omega_{n-1} = 0 : \Sigma \textbf{ racines nulle} \\ z = (-1)^{n-1}\ \omega_0 \times ... \times \omega_{n-1} \textbf{Produits racines nulle} \end{cases} \tag{10}$$

$$\begin{cases} cos(2\theta) = cos^2(\theta) - sin^2(\theta) \\ cos(2\theta) = 2cos^2(\theta) \\ cos(theta) = \sqrt{\dfrac{1 + cos\theta}{2}} \end{cases} \tag{11}$$

$$\frac{r.e^{i.\theta}}{r'.e^{i.\theta'}} = \frac{r}{r'} \tag{12}$$

## 1.2 Polynômes

$$\begin{cases} deg(0) = -\infty \\ deg\ P + deg\ Q = deg(P.Q) \\ deg(P+Q) \leq max(deg(P), deg(Q)) \end{cases} \tag{13}$$

**Definition 1.**

$$A, B\ \in\ K[A];\ B \mid A\ , tq,\ A = B.Q \tag{14}$$

**Definition 2.**

$$A, B\ \in\ K[X];\ A \mid B\ \&B \mid A \Longleftrightarrow \exists\ \lambda\ inK^*,\ A = \lambda.B \tag{15}$$

**Definition 3.**

$$\begin{aligned} A, B\ \in\ K[X];\ tq\ B \neq 0; \exists\ unique\ couple\ (Q,R)\ dans\ K[X], \\ A = BQ + R\ avec\ deg\ R < deg\ B\ \ ou\ R = 0 \end{aligned} \tag{16}$$