University Abou Bekr Belkaid - Tlemcen
Faculty of Technology
Department of common core ST

Academic Year 2025-2026
Algebra 1
First year Engineering and LMD in ST

ALGEBRA 1

Exam

Duration 2 h ***No Calculators or Notes allowed***

Exercise 1 *1. Give the correct answer*

$$A = \{n \in \mathbb{N}^* \setminus n < 5\}\,, \quad \textit{then } (a)\ A = \{0,1,2,3,4\}\,,\ (b)\ A = \{1,2,3,4\}\,,\ (c)\ A = \{1,2,3,4,5\}\,.$$

2. Let A and B be two sub-sets of a set E. Answer true or false

a. $A \setminus B = B \setminus A$
b. $\emptyset \subset A$
c. $A \cup B \subset A \cap B$
d. If $A \cup B = A$, *then* $B \subset A$

Exercise 2 *Let $\mathcal{R}$ be a relation defined on $\mathbb{R}$ by*

$$x\mathcal{R}y \Longleftrightarrow x^2 - y^2 = x - y\,.$$

1. Prove that $\mathcal{R}$ is an equivalence relation;
2. Prove that $cl(0) = cl(1)$.

Exercise 3 *Let*

$$\begin{array}{rcl} f : \mathbb{R} - \{1\}\} & \to & \mathbb{R} \\ x & \mapsto & f(x) = \dfrac{x+2}{x-1} \end{array}$$

be a function.

1. Show that f is a map.
2. Show that f is injective.
3. Compute $f^{-1}(\{0,1\})$.
4. Is f surjective?

Exercise 4 *1. Solve in $\mathbb{C}$ the equation* $z^2 + 2z + 4 = 0$.

2. Let be $z_1 = -1 - i\sqrt{3}$ *and* $z_2 = 1 + i$.
a. Compute $z_1 \times z_2$.
b. Give the trigonometric form of z_1, z_2 and $z_1 \times z_2$.
c. Deduce $\cos\frac{19\pi}{12}$ *and* $\sin\frac{19\pi}{12}$.

Exercise 5 *Let be* $E = \{(3x, 2y, -z) \setminus x, y, z \in \mathbb{R}\}$.

Prove that E is a vector sub-space of $\mathbb{R}^3$.