EXERCISES 5

MATTEO RIZZI

(1) Determine
   (a) the complement of the set $A := (-\infty, 0) \cup (1, \infty)$ in $\mathbb{R}$.
   (b) the intersection of the sets $B := (-\infty, 1) \cup (2, \infty)$ and $C := \{1\}$.

(2) Find the real solutions of the following equations and inequalities:
   (a) $e^{1-|x+3|} > 1$
   (b) $x^6 + 3x^3 + 2 > 0$
   (c) $(\log x)^2 + 3\log_3 x + 2 > 0$
   (d) $\cos^2(4x) - \sin^2(4x) = 1$
   (e) $e^{2\sin x \cos x} < 1$

(3) Consider the function $f(x) := \log_3\left(\frac{x^2+1}{x^2-1}\right)$.
   (a) Determine the domain $D(f)$ of f.
   (b) Determine the zeros of f.
   (c) Is $f : D(f) \to \mathbb{R}$ even.
   (d) Is $f : D(f) \to \mathbb{R}$ injective?
   (e) Determine the set $f^{-1}((1, +\infty))$.

(4) Let $f(x) := (\log x)^3 - 1$.
   (a) Determine the domain $D(f)$ of f.
   (b) Say if $f : D(f) \to f(D(f))$ is invertible and, in case it is, determine $f(D(f))$ and the inverse.

Universitá degli studi di Bari Aldo Moro
Email address: matteo.rizzi@uniba.it, mrizzi1988@gmail.com