

CALCULUS 1
Information Engineering

23.01.2023

THEME 1

Exercise 1 Consider the function

$$f(x) =$$

- (a) find the maximal domain of di f ;
- (b) compute the limits (where this is meaningful) and the asymptotes, provided the latter exist,;
- (c) study the differentiability of f , compute the derivative at the interior points of the domain and the derivative's limits at the remaining points of the domain; discuss the monotonicity of f and establish if f is upper [resp. lower] bounded, and in the affirmative case compute the supremum [resp. the infimum] of f ; if existing, find the (absolute or relative) maximum or minimum points. ;
- (d) draw a qualitative graph of f .

Exercise 2

Exercise 3

Exercise 4

Time at disposal: 2 hours and a half (including the theoretical question, which must be done after 30 minutes from the beginning). It is forbidden the use of books, notes, phones, and computers of any kind.

Taylor expansions:

$$\arcsin y = y + \frac{y^3}{6} + o(y^4) \quad \arctan y = y - \frac{y^3}{3} + o(y^4)$$

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