Democratic and Popular Republic of Algeria

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Analysis 1

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Exercises Serie N° 5

Exercise 1

Consider the function f defined by

$$f(x) = x^x$$

1. *On what set is this function defined and continuous?*
2. *Show that f is extendable by continuity on $[0, \infty[$.*
3. *Calculating the derivative of f wherever it is not a problem. On what set is f differentiable, what can we deduce about the graph of f at 0?*
4. *Study the variations of f on $[0, \infty[$. Then calculate the limit of f in ∞.*
5. *Sketch the graph of f.*

Exercise 2

1. *Let a and b be two real numbers, show that:*

$$ch(a)ch(b) = \frac{1}{2}(ch(a+b) + ch(a-b)).$$

2. *Show that $\forall t \in \mathbb{R}$*

$$\cos(2t) = \frac{1 - \tan^2(t)}{1 + \tan^2(t)}$$

Exercise 3

Soit $a \in \mathbb{R}, \quad a > 0$. Solve:

$$\ln(ch(x)) = a.$$

Exercise 4

Calculate limits:

1. $\lim_{x \to +\infty} e^{-x}(ch^3(x) - sh^3(x))$.
2. $\lim_{x \to +\infty} x - \ln(ch(x))$.