Analyse 1

HOMEWORK 8: DUE THURSDAY DECEMBER 15 IN CLASS

In all this exercise sheet, we will denote with $\log(x)$, the logarithm with base e.

You are NOT ALLOWED to use L'Hopital rule to compute the limits (because you need to gain confidence about the use of Taylor expansions).

Exercise I

Compute the following limits

1. $$\lim_{x\to 0} \frac{\sqrt[4]{1-x^2}-\sqrt{\cos(x)}}{\arctan^4(x)}$$
2. $$\lim_{x\to 0^+} \frac{\sin(x)}{\sin(x+1)}\frac{\log(x)}{\log(x+1)}$$
3. $$\lim_{x\to \pi} \frac{\tan(x)}{e^x-e^\pi}$$
4. $$\lim_{x\to 0^+} \frac{x\log(1+\sin(2x))-\sin(x)\log(1+2x)}{x^2\sin^2(x)}$$

Exercise II

Study the main properties (monotonicity, (local) maxima and minima, convexity) and draw the graph of the following function

$$f(x)=\log(3^{2x}-3^x+1)$$

Exercise III

1. Study the main properties (monotonicity, (local) maxima and minima, convexity) and draw the graph of the following function
$$f(x)=\log(1+2e^{3x})\ .$$
2. Find the number of solutions of the equation $f(x)-\lambda x=0$ for every $\lambda\in\mathbb{R}$.