

# MATHEMATICS

## Midterm Exam

12/12/2014, A.Y. 2014/2015

Lastname ..... Name .....

1) (15 p.ts) Study the function  $f(x) = \frac{1-\ln x}{\ln x}$ : domain, sign, limits, asymptotes, maximum and minimum points and graph.

2) (6 p.ts) Write the Taylor polynomial of degree 4 for  $f(x) = e^{x-1}$  in  $x = 1$  and use it to find an approximation of  $e$ .

3) (3 p.ts) Can we apply Lagrange's Theorem to  $f(x) = 2x + |x + 1|$  in  $[-1, 1]$ ? Motivate your answer.

4) (3 p.ts) Evaluate  $\lim_{n \rightarrow +\infty} \left( \frac{3n+5}{3n} \right)^{2n}$  .

5) (3 p.ti) Given the function  $f(x) = \frac{x^2-1}{4-x^2}$ , find its domain and where it attains positive values.