

Course : **Mathematics B2 (Newton)**

Date : November 28, 2014

Time : 13.45 - 14.45

**Motivate all your answers and calculations.
Use of electronic devices is not allowed.**

1. [3p] The function $f : \mathbb{R} \rightarrow \mathbb{R}$ is defined by

$$f(x) = \begin{cases} x^2 + ax & \text{if } x \leq 1 \\ \frac{x^2 - 1}{x - 1} & \text{if } x > 1 \end{cases}$$

For what value of the constant a is the function f continuous at $x = 1$?

2. [3p] Evaluate

$$\lim_{t \rightarrow 0} \frac{\ln(2t^2 + 1)}{t^2}$$

3. [4p] Find the absolute extrema of the function

$$f(x) = \sqrt{x}(3 - x)$$

on the interval $[0, 4]$.

4. [4p] Find

$$\lim_{(x,y) \rightarrow (0,0)} \frac{x^3 + y^3}{x^2 + y^2}$$

(hint: use polar coordinates)

5. [4p] Find an equation for the tangent plane to

$$z = x \sin(x + y)$$

at the point $(-1, 1, 0)$.

Total: 18 points