

Test of Mathematics

January 26, 2016

Name:.....Surname:.....

Matriculation number:.....

1. Determine the domain of the following function:

$$f(x) = \log(1 - \log^2 x)$$

2. Consider the real-valued function defined as follows:

$$y = f(x) = \begin{cases} 1 - x^2 & \text{if } x < 0 \\ x^3 + 1 & \text{if } x \geq 0 \end{cases} .$$

Determine the inverse function $x = f^{-1}(y)$.

3. Determine the following limit:

$$\lim_{x \rightarrow 1} \frac{e^{\cos(x-1)} - e}{1 - \cos^2(x-1)} .$$

4. Study the following function and draw its graph (just consider the first derivative):

$$f(x) = x^2 e^{-\frac{1}{x}} .$$

Determine the point(s) at which the function is equal to zero.

5. Determine the following indefinite integral:

$$\int \sin x \sqrt{\cos x} \, dx .$$

6. Determine the derivatives $f'_x(x, y)$ and $f'_y(x, y)$ of the following real-valued function of two real variables:

$$z = f(x, y) = \arcsin(x - y) .$$