Test of Mathematics

June 22nd, 2015

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

Matriculation number:........................

1. Determine the domain of the function

$$f(x) = log(1 - e^{-x})$$

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

$$y = f(x) = \begin{cases} log(x+1) & \text{if } -1 < x \le 0 \\ e^{-x} & \text{if } x > 0 \end{cases} .$$

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

3. Determine the following limit:

$$\lim_{x \to +\infty} \frac{e^{\frac{1}{x}} - 1}{sin\frac{2}{x}}.$$

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

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

5. Determine the following indefinite integral:

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

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

$$z = f(x,y) = \frac{x}{x-y}.$$