MATHEMATICS-1 **Test1-A** **NAME: .....**

16 October 2009

1. (6p)	2. (5p)	3. (5p)	4.(5p)	5. (10p)	6. (4p)	Th. (5p)	Σ (Max 40p)

Corrected by: ……

1. a.) Find $N(\varepsilon)$ for the sequence $a_n = \dfrac{n^2}{2n^2+1}$ if $\varepsilon=0{,}02$.

   b.) Find the following limit: $\lim\limits_{n\to\infty}\left(\dfrac{n+3}{n-1}\right)^{2n}$

2. Find the points of discontinuity for the following function, and classify them:

$$f(x)=\begin{cases} x^2 & \text{if} \quad x\le 0 \\ \dfrac{\sin 2x}{x} & \text{if} \quad 0<x<\pi \\ \sin 2x & \text{if} \quad x\ge \pi \end{cases}$$

3. Find the equation of the tangent line to $f(x)=x^3+\sqrt{5x-1}$ at the point $x_0=2$!

4. Find the derivative of the following functions

   a.) by definition: $f(x)=\sqrt{5x-1}$ b.) by rules: $g(x)=\dfrac{x^2+3x}{\cos(2x)}$

5. Sketch the graph of the function $f(x)=x^3+\dfrac{3}{x}$

6. Evaluate $\underline{a}\cdot\underline{b}$ and $\underline{a}\times\underline{b}$ if $\begin{cases}\underline{a}=4\underline{i}-2\underline{j}+3\underline{k}\\ \underline{b}=5\underline{i}-\underline{j}\end{cases}$

Theoretical question:

Using $\left[\tan\left(\tan^{-1}x\right)\right]'=x$, and the chain rule, show that $\left(\tan^{-1}x\right)'=\dfrac{1}{1+x^2}$