Calculus en Kansrekening
Assignment 1, September 4, 2014

Handing in your answers: the full story, see

Briefly,

- submission via Blackboard (`http://blackboard.ru.nl`);
- one single pdf file;
- make sure to write your name and your student.
  - your name;
  - your student number and
  - the name of your TA (Safet and Arjen OR Ana Helena OR Gergely)

Deadline: Friday, September 12, 13:30 sharp!

Goals: After completing these exercises successfully you should be confident with the following topics.

- The domain and range of a function
- Injective, surjective functions and the inverse of a function
- The equation of a line in the plane and the slope of a line
- The notion of limit and computing limits

Marks: You can score a total of 100 points.

1. **(24 points)** Determine the domains and ranges of the following functions.

   (a) $f(x) = -\sqrt{2 - x^2} + 2$

   (b) $f(x) = \frac{x-3}{x^2-9}$

   (c) $f(x) = \frac{1}{\sqrt{x^2 - (3x+4)}}$

2. **(30 points)** After determining the domain and the range of the following functions, decide whether they are injective and/or surjective? Find the inverses of them if possible. If not possible, restrict the domain to make it possible.

   (a) $f(x) = x^2 + 1$

   (b) $f(x) = \ln(x - 1)$

   (c) $f(x) = \sqrt[3]{4 - x^3}$

3. **(26 points)** Given the equation $5x - 4y = 9$.

   (a) Find the slope of the line having the equation above.

   (b) Do the points $(1, -1)$, $(0, \pi)$ and $(4, -2)$ lie on the line?

   (c) What is the distance between the origin and the point on the line of which x-coordinate is 13?

4. **(20 points)** Find the limits. (Hint: try to simplify as much as possible before applying the limit!)

   (a) $\lim\limits_{x \to 4} \frac{x-4}{x^2-2x-8}$

   (b) $\lim\limits_{x \to 3} \frac{x^3-27}{x^2-9}$ (Remember the identity $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$. You may want to check this.)

   (c) $\lim\limits_{x \to h} \frac{2(x+h)-2x}{h}$

   (d) $\lim\limits_{x \to h} \frac{(x+h)^2-x^2}{h}$