

Calculus en Kansrekening

Assignment 8 (mock exam), October 13, 2015

Handing in your answers:

- submission via Blackboard (<http://blackboard.ru.nl>);
- one single pdf file (make sure that if you scan/photo your handwritten assignment, the result is clearly readable);
- all of your solutions are clearly and convincingly explained;
- you are NOT allowed to use a programmable calculator, a computer or a mobile phone. The only device allowed is a simple calculator.
- make sure to write your name, your student number and **the name of your TA** (Joost or Bram).

Deadline: Friday, October 24, 14:30 sharp!

Marks: You can score a total of 100 points.

1. **(25 points)**(goals: domain, limits, derivatives, extremes, monotonicity, inflection points, convexity/concavity, curve sketching)

Sketch the graph of $y = f(x) = \frac{2x-1}{(x-1)^2}$. Investigate first all the points required i.e. domain, parity, limits, extremes, monotonicity and asymptotes, points of inflection and convexity/concavity.

2. **(15 points)**(goals: derivatives and applications, tangent lines)

The following function is given: $f(x) = e^{1-x^2}$. Find the tangent lines to the function f in the points where the graph of f intersects the line $y = 1$.

3. **(20 points)**(goals: integrals and applications)

Compute the area bounded by the two parabolas: $y = \frac{x^2}{3}$ and $y = 4 - \frac{2}{3}x^2$. Sketch the area first.

4. **(20 points)**(goals: probabilities, discrete random variable, expectation)

We are considering families with 4 children and we assume the probability of a male birth is $1/2$. Answer the following questions:

- Find the probability that there will be at least 1 boy in a family.
- Find the probability that there will be at least 1 boy and at least 1 girl in a family.
- Out of 2000 families with 4 children each, how many would you expect to have exactly 2 boys?

5. **(20 points)**(goals: distribution function and probability density function of a continuous random variable, integrals)

A random variable X has density function:

$$f(x) = \begin{cases} cx^2, & 1 \leq x \leq 2 \\ cx, & 2 < x < 3. \\ 0, & \text{otherwise} \end{cases}$$

Find: (a) the constant c , (b) $P(X > 2)$, (c) $P(2 < X < 3/2)$.