Calculus en Kansrekening

Assignment 5, October 2, 2014

Handing in your answers: To read the full story, see

`http://www.ru.nl/ds/education/courses/analyse_2014/`

Briefly,

- make sure to put
  - your name;
  - your student number and
  - the name of your TA (Safet and Arjen OR Ana Helena OR Gergely)

  on your solution sheet;
- submit via Blackboard (`http://blackboard.ru.nl`);
- it is one single pdf file.

Deadline: Friday, October 9, 13:30 sharp!

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

- Applying the method of integration by parts;
- Finding indefinite and definite integrals with the most essential methods;
- Arc length of a curve;
- Area enclosed by one or more curves;
- Applying integration in a broader context.

Marks: You can score a total of 100 points. Note that you have to **explain your answers**, so it is clear how you have got the result. In order to get full points, you need to make sure that the reader can understand each step in your solution.

1. **(40 points)** Use the method of integration by parts and **verify** your result. (You may need some tricks at some problems, such as applying the method more than once, or using substitution too.)
   (a) $\int x \cdot e^{2x}\, dx$;
   (b) $\int x^2 \sin(x)\, dx$;
   (c) $\int x^3 \cos(x^2)\, dx$;
   (d) $\int (x^3 - 3x)e^{-x^2+3}\, dx$.
2. **(20 points)** Given two functions: $f(x) = x + 4$ and $g(x) = 2x^2$.
   (a) Find the area of the region bounded above by the line of f, below by the parabola of g, and from the sides by the y axis and the $x = 1$ line.
   (b) Find the area bounded by the graphs of f and g.

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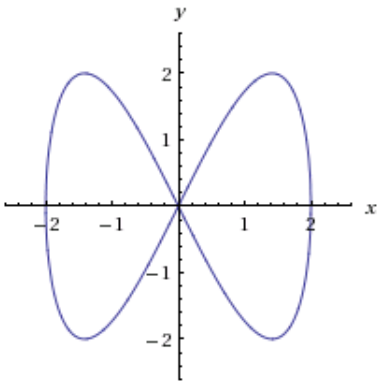
3. **(20 points)** Given the curve $y^2 = 4x^2 - x^4$, sketched below. What is the area enclosed by this curve?



4. **(20 points)** Given the curve $y = 3x^{3/2} - 1$.

   (a) Find the points on the curve at $x = 0$ and $x = 4$ and determine the length of the straight line between these points.

   (b) Find the arc length of the curve from $x = 0$ to $x = 4$.

   (c) Compare the two results in (a) and (b) and try to explain your opinion.